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Nr. 3. Bjarni Sæmundsson: ON THE AGE AND GROWTH OF THE COD (GADUS CALLARIAS L.) IN ICELANDIC WATERS

KØBENHAVN
C. A. REITZEL, BOGHANDEL
BIANCO LUNOS BOGTRYKKERI
1923

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ON THE AGE AND GROWTH OF THE COD (*GADUS CALLARIAS* L.) IN ICELANDIC WATERS

BY

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1. Introduction.

In my work, "Oversigt over Islands Fiske"[1], I gave a brief account of the ichthyo-biological investigations, carried out in the waters of Iceland by Danish naturalists, from Danish fishing smacks, survey or inspection-ships and the research-steamer "Thor", and by the present writer, during the last decade of the nineteenth and the first one of the present century. These investigations have partly dealt with age and growth determinations, as the size of a great number of several species of foodfishes was measured and the age and growth of the youngest 3—4 age-classes of them determined with a certain degree of accuracy — by the Petersen-method. Age-determinations of this kind on a large scale were carried out on board the "Thor" by Dr. Johs. Schmidt, the well-known leader of the Danish Fishery-Investigations in Icelandic waters and in the Atlantic, who measured a vast number of cod of every size and from all parts of the coast. An account of these measurements is given by Dr. Schmidt in his excellent book: "Fiskeriundersøgelser ved Island og Færøerne i Sommeren 1903"[2]. Besides this a considerable number of cod and plaice were measured and marked on board the "Thor", and then liberated in the summer 1903—5. Later on these marking experiments were continued in the summer 1908 and 1909 by Dr. Schmidt himself and the master of the "Thor" Capt. G. Hansen, from Icelandic fishing vessels. Of the marked fishes fairly many were recaptured, as communicated by Schmidt[3] and the present writer[4], and in this way much valuable information about the growth of the two species in question was gained.

Investigations on age and growth of Icelandic fishes, based upon the growth-lines or annual rings in bones, scales and otoliths (the Reibisch method) were not carried out during the first seven years of our century. It was not until the summer of 1908 that the Danish zoologist Knud Jessen collected material of this kind (plaice and dab) in Faxa Bay and the fjords on the North-west coast, and published the results in the following year[5]. In 1910 Johan Hjort, the well-known Norvegian biologist, published the results of his investigations on the age and growth of Icelandic herring, from material collected on the South-west North-west and North coast of Iceland in the summer of 1908 and 1909[6].

In the summer of 1908 Dr. Johs. Schmidt revisited Iceland on board the "Thor" and collected a rich material for investigations of this kind from cod, haddock and halibut on the Southwest- and Eastcoast and in the next summer Capt. Hansen continued the work in Faxa Bay. Up to now, however, only the material concerning the halibut has been fully examined and the results published by P. Jespersen M. Sc. in 1917[7]. Since the time above mentioned (ɔ: 1909), no material for age determinations

[1] Skrifter udgivne af Komm. for Havundersøgelser No. 5. Kh. 1909.
[2] — — - — - — No. 1. Kh. 1904.
[3] Meddelelser fra Komm. f. Havundersøgelser, Serie: Fiskeri II. 6. Kh. 1907.
[4] Ibidem. Fiskeri, IV. 7. 1913.
[5] Fiskeriberetningen 1908, p. 241—256. Kh. 1909.
[6] Publications de circonstance, No. 53. 1916.
[7] Meddel. fra Komm. f. Havundersøgelser, Serie: Fiskeri. V. 5. Kh. 1917.

has been collected by foreign naturalists from Iceland, nor has any paper dealing with matters of that kind been published by those, except the above mentioned one by JESPERSEN.

After 1910 there appeared no prospect of further such investigations in the near future, from foreign quarters; I therefore undertook myself to collect material for this purpose. But as both my time and the funds at my disposal were very limited, I found it most practical to cooperate with the fishermen themselves, visiting during my summer holidays important fishing places on different parts of the coast, to collect the material I wanted from fish landed by the fishing boats. Thus I succeeded, in the course of 8—10 years, in obtaining material from some of our most important marine food-fishes, especially from the cod, haddock, coalfish, whiting, ling, plaice and other flat fishes, and the herring. I did not however confine my attention to marine-fishes only, I also procured material from the salmon, in different rivers and from trout and charr in our largest lakes, collected partly, by myself, partly by people, interested in the matter.

I have examined most of the marine-material and from time to time published, in Icelandic, some of the results in my biennial Reports to the Government[1]. The freshwater-material I handed over to Dr. KNUT DAHL, the well-known Norwegian hydro-biologist, who kindly undertook to examine it and has given me short provisional accounts of the results, which I have published in connection with my above mentioned Reports; but unfortuneately no exhaustive account has hitherto appeared in any of the greater languages.

As to my own investigations on the matter in question, I think I have, concerning the cod, brought them so far as to be able to give the principal features of its age and growth on the different parts of the coast of Iceland, and I shall in the following pages try to give a brief account of this most important of Icelandic fishes, and hope later on to be able to add the haddock, the whiting, the coalfish and perhaps other species. To the age- and growth-determinations I can add some other biological records, as I have had, when collecting material for the said purpose and on my investigation-trips or onboard the "Thor", good leisure to make observations as to maturity, food etc.

Finally I wish to express my heartiest thanks to Dr. JOHS. SCHMIDT and Dr. A. C. JOHANSEN for the facilities they gave me for studying and practising in their laboratories the various methods of examining material commononly used for investigations of this kind, during my visit to Copenhagen in 1912. To the first-mentioned I am also highly indebted for the liberality with which he left the research-journals of the "Thor" at my disposal and permitted me to use their contents for my purpose.

After these introductory remarks I shall give an account of the above mentioned age- and growth-determinations of the cod and to this add some biological records of other kinds.

2. Age- and growth-determinations.

a. Collection of material.

The cod is the most valuable of all Icelandic fishes, especially for the Icelanders themselves — by whom it was from old times often simply called "fiskur", ɔ: the fish par excellence. I therefore wished, in the first instance, to make out its growth and the age at which it reaches maturity, considering this one of the most interesting events in the life of a fish of great economical importance. Further, I wished to get an idea of its age in general, then to know the age at which it is most captured, and, as far as possible, find out the maximum of age it can reach in Icelandic waters.

[1] Fiskirannsóknir, issued since 1896.

In 1913 I began collecting material, and for that purpose I made a trip to the North-east coast, where in the middle of July, I visited Raufarhöfn on the west-side of the Thistilfjord and, in the beginning of August, Husavik, a noteworthy fishing place on the east-side of the Skjalfandi Bay. At Raufarhöfn I collected material from 97 specimens of small, immature, mostly reddish coloured fish, caught on handlines at 20 m. depth in the bay off the place. At Husavik I took material from 98 specimens, caught from the piers in quite shallow water (1—2 m. only), 60 specimens, mostly small, immature fish, taken on longlines at 20 m. depth in the bay, 64 specimens caught in deeper water, 150 m. in the Axarfjord, small, immature and grown-up fish mixed together, and 35 specimens taken in the mouth of Skjalfandi Bay, in 110—180 m., most of them mature fish. All the fish from deeper water were taken by motor-boats. The total number of fish, examined at Husavik was 257.

On the way home, in the coasting steamer, I added 19 specimens of young fish line-caught from the steamer while stopping at Hrisey in the Eyjafjord, and later on, when delayed by fog in the Huna Bay, Aug. 10th, 10 more specimens were similarly captured in deep water (150—210 m.).

In 1915 I continued collecting material on the North-west coast of the large peninsula between Huna Bay and Breidafjord. First I took up my quarters at Isafjord, from July 26th to Aug. 5th, where fish from catches, made either by open boats in the Isafjord Deep, or by motor-boats operating outside the fjords, were placed at my disposal. — Here I got material from 247 specimens of immature fish, caught on handlines or longlines at three different places and at depths from 8 to 90 m. in the "Deep", and from 47 specimens of young and grown-up fish, taken at three different places and in depths from 60 to 110 m. on the banks 10—16 miles off the headlands between the fjords. — From Isafjord I moved to Patreksfjord, the southernmost of the fjords on the north-west side of the peninsula, where I stayed till the 17th of Aug., and collected material from 45 young fishes caught with the eel-seine, hauled ashore from 22 m. depth and from 135 young fishes taken on longlines in 40—50 m. in the bay outside the fjord.

In the middle of July 1916 I visited the small trading and fishing station of Olafsvik on the north coast of Snæfellsnes, and collected material from 173 cod of varying size and degree of maturity, caught on handlines and longlines, at 40—50 m. depth in the Breidafjord, off the place.

In the summer 1918 I went to Akranes, an important fishing place, situated on the extreme point of a peninsula projecting out into Faxa Bay, some 10 miles NW. of Reykjavik. Here I stayed from the 25th of July to the 2nd ot Aug., and procured material from 229 cod, mostly small fish, caught on longlines and handlines at 15—30 m. depth off the place. — Besides this I have occasionally collected and examined material for age determination from a considerable number of cod landed at Reykjavik during the 10 last years, chiefly in the summer and autumn, and caught at 35—45 m. depth in Faxa Bay, and a small number of codlings line-caught in Skerjafjord and Hafnarfjord (two inlets in the vicinity of Reykjavik). — In addition to these small-sized fish I have also examined material from nearly 200 cod, collected by Capt. Hansen, the master of the "Thor", on board an Icelandic steam trawler, at 40—45 m. depth, out in Faxa Bay in June 1909.

In the beginning of Sept. 1916, and in the middle of Aug. 1917 I collected material from 121, mostly immature cod, caught on longlines in 45—55 m. off Grindavik on the south coast of the Reykjanes-peninsula. In the latter half of July 1917 I stayed at Eyrarbakki, a trading and fishing station on the south coast, and procured there material from 61 cod, mature and immature, taken by motor boats on long lines at 75—110 m. depth off Krisuvikurberg, and from 78 cod, mostly mature fish, caught by the same boats on the famous offshore fishing ground, the Selvogsbanki, at 110—130 m. depth, 4—6 miles of Selvogstangar.

In 1919 I visited the Westman Isles, where I collected material from 200 cod, mostly mature fish, caught on longlines and handlines by motor boats, at 45—95 m. depth, near Drangar, in the beginning of Aug., and from 38, for the greater part mature fish taken by an open boat in the vicinity of Heimaey, at 55 m., Aug. 14th.

In the summer of 1920 I revisited the North coast, this time the Eyjafjord, where I collected material from 202 young cod, taken with the eel-seine hauled from 20—25 m. to the shore at Svalbardseyri on the inner part of the fjord July 9th—10th. From that place I moved to Hrisey, an island in the outer part of the fjord, where I collected material from 226 mostly immature fish, taken by open boats on long lines or handlines at 28—95 m. depth, July 14th—19th, and from 95, for the greater part mature fish, caught by motor boats on long lines, on an offshore bank, named Tangar, NW of Siglufjord at 150—280 m. depth, July 18th—19th.

Finally I went to the East coast that same summer, where I stayed from Aug. 2nd to 10th at Nordfjord, the most important fishing place on that side of the country. Here I collected material from 219 young cod, chiefly line-caught from the local piers, from 113, mostly immature fish, taken on long lines by open boats, at 40—50 m., and from 123 cod, the majority mature, taken by motor boats at 55—95 m. depth.

According to the records given above, I have in the course of 8 years collected material for age determination from specimens of cod as follows:

From the South coast	from	abt.	490	specimens	
— - South-west coast	—	-	640	—	
— - North-west coast	—	-	560	—	
— - North coast	—	-	1100	—	
— - East coast	—	-	440	—	
		Total...	abt.	3230	specimens

b. Material and methods.

The chief material, I have used for the determination of the age, is the otoliths, which I have always taken personally from the fresh, newly caught fish[1]. In the case of young fish, I have also frequently taken and used the scales, thus checking the correctness of determination. From fish landed in Reykjavik I have also used the coracoid, and the material collected by Capt. Hansen was exclusively the pelvic bone (basipterygidium). With exception of this material, which was preserved in alcohol, all the remainder was put in paper envelopes and dried.

The method I followed was the counting of the growth-rings on a transverse-section of the otolith[2]. I have broken the otoliths — of which the right and the left proved to be of the same value — over in the middle, fixing the very place, where I wished to break them by making a notch with the edge of a small planeconvex file in the "back" (the convex side) of the otolith[3]. Then I originally polished the fracture-surface of each part of the otolith on a smooth grindstone, considering it as a necessary operation for accurate reading of the growth rings, but after a time, as my experience increased, I found this unnecessary, except when dealing with otoliths having a great number (over 8) of growth rings; in smaller ones the raw fracture-surface allowed in most cases a quite reliable reading. The reading of the growth rings was performed by the aid of low power (×2—4) magnifying lens, and by a faint light from a parafin lamp, which, penetrating and lighting up the opaline substance of the otolith, showed the rings very clearly, when viewed with the otolith in a proper position between the eye and the light (see fig. 1).

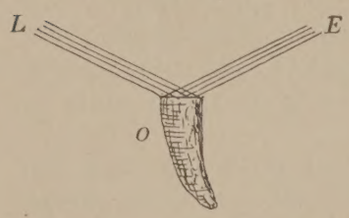

Fig. 1. The approximate position of otolith, *O*, to the light, *L*, and to the eye, *E* (see text).

[1] Besides otoliths taken in this way, I have now and then taken and examined otoliths from heads cut off and thrown away.

[2] Concerning the value of the growth rings in otoliths for age-determination see Winge: On the value of the rings in the scales of the cod etc. Meddel. f. Komm. for Havundersøgelser. Serie Fiskeri, IV. No. 8, p. 18—20.

[3] Concerning the shape and structure of the otolith of the cod see Winge op. cit. and Aarsberetn. vedk. Norges Fiskerier, 1920, p. 53—56.

The part of the section which proved to be the best for reading was the sector *a* in the fig. 2, *C*. Besides the simple operations necessary for age-determination from the otolith, which render them very convenient for age determinations of large material, they have the great advantage that the first winter-ring is always conspicuous, while this as a rule is very indistinct or hidden in the coracoid and the pelvic bone (see fig. 2 *A* and *B*), except in quite young specimens.

Otoliths with a low number of rings I seldom failed to read by this method; and when dealing with one to three-year-old fish, I often checked the result, as mentioned above, by using the scales which were laid in water and examined in the usual way under the microscope. But in the case of older otoliths (10 years or more) I was sometimes unable to make clear the exact number of growth rings (years of age), the possible error being one or two years, and in case of very old ones, those about 20 years, sometime even more.

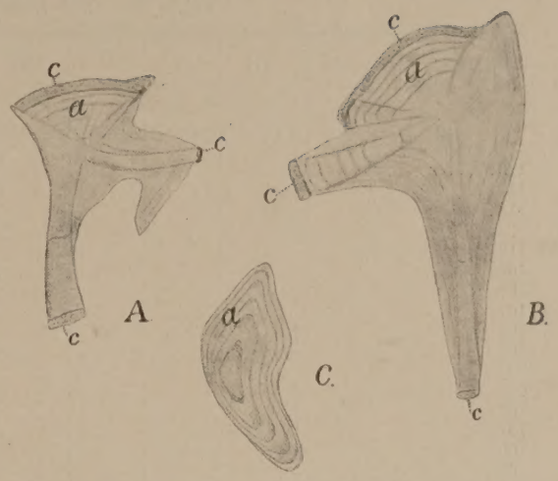

Fig. 2. *A* the pelvic bone, *B* the Coracoid of a 6 years old Cod (nat. size). *C* transverse section of an otolith of a 6 years old Cod (×2). *c* cartilages; a section best fit for reading. Winter-lines dark.

c. Treatment of the material.

In the treatment I am going to give of the material, I find it convenient to divide it into five distinct sections, corresponding to the difference I have found in the growth of the fish from different parts of the coast of Iceland, though I must at once emphasise, that "pure" material is out of the question here, because the fish from different sections will mix together, partly in the warmer area, during the spawning season, partly (feeding) in the colder one during the warmer part of the year[1]. I have also, in accordance with the above, examined otoliths from a colder section, the first 4—5 growth-rings of which showed clearly by their great development, that the fish they belonged to had grown up in a warmer district. Further investigations (especially racial) will perhaps elucidate this interesting matter thoroughly.

For this reason I find it most convenient to begin with the warmest section, the South coast, then turn to the right and finish with the East coast. The five sections will consequently be:

α. The South coast, from Eystra Horn to Reykjanes,
β. The South-west coast, from Reykjanes to Breidafjord,
γ. The North-west coast, from Breidafjord to Straumnes,
δ. The North coast, from Straumnes to Langanes,
ε. The East coast, from Langanes to Eystra Horn.

α. The South coast.

As recorded above, the material from this section consists of abt. 490 specimens, collected in different years, during the summer months, mostly from the middle of July to the middle of August. The particulars will be seen from the following Tables.

As will be seen from these Tables, which embrace all the fish examined from the south coast, the I-group is very poorly represented, as only few specimens were obtainable, owing to the circumstance, that fish of this age either live in shallow water (10—15 m.), mostly in the *Laminaria*-region, where no

[1] Cfr. the above quoted Meddel. fra Komm. for Havundersøgelser, Serie Fiskeri, II, 6. Kh. 1907 and IV, 6. Kh. 1913.

Table 1. Cod from the Westman Isles, August 1919.

Age groups....	II		III		IV		V		VI		VII		VIII		IX		X		XI		XII		XIII		XIV		XV	
Sex.....	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm																												
120.....	..		..		..		..		..		..		..		..		..		..		..		1		..		..	
119.....	..		..		..		..		..		..		..		..		..		..		..		..		..		..	
118.....	..		..		..		..		..		..		..		..		..		..		1		..		..		..	
.																												
110.....	..		..		..		..		..		..		1		..		..		..		..		..		..		..	
109.....	..		..		..		..		..		..		..		..		..		..		..		..		..		..	
108.....	..		..		..		..		..		..		1		1		..		1		..		..		..		..	
107.....	..		..		..		..		..		..		..		..		..		..		..		..		..		..	
106.....	..		..		..		..		..		..		..		..		1		..		..		..		..		..	
105.....	..		..		..		..		..		1		..		1		1		..		..		..		..		..	
104.....	..		..		..		..		..		..		..		..		2		..		..		..		..		..	
103.....	..		..		..		..		..		..		2		1		1		..		..		..		..		..	1
102.....	..		..		..		..		..	1		1		..		1			..		..		..		..		..	
101.....	..		..		..		..		..	1		2	1		2		..		..		..		..		..		..	
100.....	..		..		..		..		..		..	5		..		1	1		..		..		..		..		..	
99.....	..		..		..		..		..		..		..		..		..		..		..		..		..		..	
98.....	..		..		..		..		..		..	2		..		..		..		..	..		..		..		..	
97.....	..		..		..		..	1	1		1	1	1	1	1	1	2		..		..		..		..		..	
96.....	..		..		..		..		..		2	1	1	1		1		..	..		..		..		..		..	
95.....	..		..		..		..		..		2	1	3		1			..	..		1		..		..		..	
94.....	..		..		..		..		1		1	1		..	1			..	..		..		..		..		..	
93.....	..		..		..		..		1	2	2	1	3	1	1			..	..		..		..		..		..	
92.....	..		..		..		..		1			2		1	1			..	1		..		..		..		..	
91.....	..		..		..		..		1			2	1	1		..		..	..		..		..		..		..	
90.....	..		..		..		..		1	1	2		2			..		..	..		..		..		..		..	
89.....	..		..		..		..		1	3		2	1	1	1			..	..		..		..		..		..	
88.....	..		..		..		..			3	4	1	1			..		..	..		..		..		..		..	
87.....	..		..		..			2	4	1	2	1	6	1		..		..	..		..		..		..		..	
86.....	..		..		..		1		3	1	2	1		1		..		..	..		..		..		..		..	
85.....	..		..		..		1		1	2	2	1	2			..		..	..		..		..		..		..	
84.....	..		..		..		1		1			1		1		..		..	..		..		..		..		..	
83.....	..		..			1	1	1	2	1	1			..		..		..	..		..		..		..		..	
82.....	..		..		..		1		1	1		..		..		..		..	..		..		..		..		..	
81.....	..		..		..		2	1		1		..	1			..		..	..		..		..		..		..	
80.....	..		..		..		4			2		..		..		..		..	..		..		..		..		..	
79.....	..		..		..			..			1			..		..		..	..		..		..		..		..	
78.....	..		..		..			1	1		1			..		..		..	..		..		..		..		..	
77.....	..		..		1			1	1			..		..		..		..	..		..		..		..		..	
76.....	..		..		2			1		..		..		..		..		..	..		..		..		..		..	
75.....	..		..		1			..	1	1		..		..		..		..	..		..		..		..		..	
74.....	..	1			1	2	1	1		..		..		..		1		..	..		..		..		..		..	
73.....	..		..			..		..		..	1			..		..		..	..		..		..		..		..	
72.....	..		..			1		1		..		..		..		..		..	..		..		..		..		..	
71.....	..		..		..			1	1			..		..		..		..	..		..		..		..		..	
70.....	..		..		1			1		..		..		..		..		..	..		..		..		..		..	
69.....	..		..			3		..	1			..		..		..		..	..		..		..		..		..	
68.....	..			1	2			..	2			..		..		..		..	..		..		..		..		..	
67.....	..		..		1	1		..		..		..		..		..		..	..		..		..		..		..	
66.....	..		..			..		..		..		..		..		..		..	..		..		..		..		..	
65.....	..		..			..	1	1		..		..		..		..		..	..		..		..		..		..	
64.....	..		..			1	1			..		..		..		..		..	..		..		..		..		..	
63.....	..		..		..			..		..		..		..		..		..	..		..		..		..		..	
62.....	..	1	1			1		..		..		..		..		..		..	..		..		..		..		..	
61.....	..	1				1		..		..		..		..		..		..	..		..		..		..		..	
60.....	..	1			..		1	1		..		..		..		..		..	..		..		..		..		..	
59.....	..			1	1			..		..		..		..		..		..	..		..		..		..		..	
58.....	..		..		1			..		..		..		..		..		..	..		..		..		..		..	
57.....	..			1		1		..		..		..		..		..		..	..		..		..		..		..	
56.....	..			1	..			..		..		..		..		..		..	..		..		..		..		..	
55.....	..			2	..			..		..		..		..		..		..	..		..		..		..		..	
54.....	..		..		2	2		..		..		..		..		..		..	..		..		..		..		..	
53.....	..		..		..			..		..		..		..		..		..	..		..		..		..		..	
52.....	..		..		..			..		..		..		..		..		..	..		..		..		..		..	
51.....	..	1			1			..		..		..		..		..		..	..		..		..		..		..	
50.....	..			1	..			..		..		..		..		..		..	..		..		..		..		..	
49.....	..		..		..			..		..		..		..		..		..	..		..		..		..		..	
48.....	2		..		..			..		..		..		..		..		..	..		..		..		..		..	
47.....	..			1	..			..		..		..		..		..		..	..		..		..		..		..	
46.....	..		..		..			..		..		..		..		..		..	..		..		..		..		..	
45.....	..			1	..			..		..		..		..		..		..	..		..		..		..		..	
44.....	..			1	..			..		..		..		..		..		..	..		..		..		..		..	
Average length.	48.0		61.6	54.3	66.2	66.6	77.8	75.5	83.1	86.3	89.0	91.3	91.0	96.8	95.0	95.8	100.0	103.0	97.0	108.0		106.5		120.0				103.0
	48,0		56,6		66,4		76,7		84,5		90,0		93,7		95,3		102,0		100,7		106,5		120,0				103,0	

Table 2. Cod from Eyrarbakki, July 1917.

Age-groups	III			IV			V			VI			VII			VIII			IX			X			X—XI			X—XII		
Sex	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀	♂	?	♀
Length cm.																														
114		..			..			..			..			..			..			..			1			..			..		
:																														
101		..			..			..			..			..			..			..			..			..	1		1		
100		..			..			..			..			..			..			..			..			..			..		
99		..			..			..			..			..			..			..			..			..			..		
98		..			..			..			..			..			..			..			..			..			..		
97		..			..			..			..			..			..			..			..			..			..		
96		..			..			..			..			..			..			..			..			..			..		
95		..			..			..		1				..			..			..			..			..			..		
94		..			..			..			..			..			..			..			..			..			..		
93		..			..			..			..			1		1			..			..			..			..		
92		..			..			..		1			1			..			..			..			..			..		
91		..			..			..		..			..			..			1			..	1		..			..		
90		..			..			..	2	1				1	1			1			..			..			..		
89		..			..			..		..			..			..			..			..			..			..		
88		..			..			..		..			..			..			..			..			..			..		
87		..			..			..	1		1	1		1		..			..			..			..			..		
86		..			..			..	1					1		..			..			..			..			..		
85		..			..			..	1		2	1				..			..			..			..			..		
84		..			..			..	2	1			1	1		..			..			..			..			..		
83		..			..				1	1	2	1	1			..			1			..			..			..		
82		..			..		1				1		..			..			..			..			..			..		
81		..			..		1		1	3	1	1		..		..			..			..			..			..		
80		..			..		1		1	1		1		..		..			..			..			..			..		
79		..			..		3			2		1	1			..			..			..			..			..		
78		..			..			..		2	1	1			1	..			..			..			..			..		
77		..				1	1		1	1	1			..		..			..			..			..			..		
76		..				1		..		1		1		..		..			..			..			..			..		
75		..			..				1	1				..		..			..			..			..			..		
74		..		1			3		1	1				..		..			..			..			..			..		
73		..			..			..		2				..		..			..			..			..			..		
72		..		1				..			1		1			..			..			..			..			..		
71		..			..			1			1			..		..			..			..			..			..		
70		..				1	1			1					1	..			..			..			..			..		
69		..		1		1	1			1				..		..			..			..			..			..		
68		..			..		2				..			..		..			..			..			..			..		
67		..				3		..			..			..		..			..			..			..			..		
66		..		1		1	3				..			..		..			..			..			..			..		
65	1			1		1		..			..			..		..			..			..			..			..		
64	1			2		1	1			1				..		..			..			..			..			..		
63		..		1	1	1		..			..			..		..			..			..			..			..		
62		..		1				..			..			..		..			..			..			..			..		
61			..	2				..			..			..		..			..			..			..			..		
60	1		2		..			..			..			..		..			..			..			..			..		
59	1		1		..			..			..			..		..			..			..			..			..		
58		..			..			..			..			..		..			..			..			..			..		
57	2				..			..			..			..		..			..			..			..			..		
56		1		1				..			..			..		..			..			..			..			..		
55		1			..			..			..			..		..			..			..			..			..		
54		..			..			..			..			..		..			..			..			..			..		
53		..		1				..			..			..		..			..			..			..			..		
52	1				..			..			..			..		..			..			..			..			..		
51		..			..			..			..			..		..			..			..			..			..		
50		..			..			..			..			..		..			..			..			..			..		
49		..			..			..			..			..		..			..			..			..			..		
48			1		..			..			..			..		..			..			..			..			..		
Average length	59.1		56.5	63.8		68.3	73.1		78.9	77.0		81.7	83.0		83.9	91.0			83.0		90.0			102,5		101.0			101.0	
	57,8			65,8			74,5			80,4			83,5			91,0			88,0			102.5			101,0			101,0		

fishing is done at all, or, when living at greater depths (20—40 m.), are too small to be caught by common fishing gear (line or cod net). The 0-group is for obvious reasons quite absent, but onboard the "Thor" I have seen good many of these young fish, at the very close of the pelagic and the beginning of their bottom life, in these tracts, in July, especially at the Westman Isles.

The growth is on the whole pretty rapid, the bulk of the specimens having reached the size of

Table 3. Cod from Grindavik, August 1917—1918.

Age-groups....	I		II		III		IV		V		VI		VII		VIII	
Sex.....	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm																
94.....	..		..		..		..		..		..		..			1
73.....	..		..		..		..			1	..		..		..	
72.....	..		..		..		..		..		1		..		..	
71.....	..		..		..		..		..		..		..		..	
70.....	..		..		..		..		..		..		..		..	
69.....	..		..		..			1	..		..		..		..	
68.....	..		..		..		..		..		..		..		..	
67.....	..		..		..		..		..		..		..		..	
66.....	..		..		..		..		..		..		..		..	
65.....	..		..		..		..		..		..		..		..	
64.....	..		..		..		..		..			1	..		..	
63.....	..		..			3	..		..		..		..		..	
62.....	..		..		..		..		..		..		..		..	
61.....	..		..		..			1	..		..		..		..	
60.....	..		..		1		..		..		..		..		..	
59.....	..		..			1	..		..		..		..		..	
58.....	..		..		1	2	..		..		..		..		..	
57.....	..		..		1		..		..		..		..		..	
56.....	..		..			1	..		..		..		..		..	
55.....	..		..		2		..		..		..		..		..	
54.....	..		..			1	..		..		..		..		..	
53.....	..		..		1		..		..		..		..		..	
52.....	..			1	2	2	..		..		..		..		..	
51.....	..		..		1	1	..		..		..		..		..	
50.....	1		1	3	..		..		..		..		..		..	
49.....	..				..		..		..		..		..		..	
48.....	..		3	2	..		..		..		..		..		..	
47.....	..		5	6	..		..		..		..		..		..	
46.....	..			3	1		..		..		..		..		..	
45.....	..		5	2	1		..		..		..		..		..	
44.....	..		4	5		1	..		..		..		..		..	
43.....	..		6	5	..		..		..		..		..		..	
42.....	..		3	4	..		..		..		..		..		..	
41.....	..		3	2	..		..		..		..		..		..	
40.....	..		4	4	..		..		..		..		..		..	
39.....	..		1	3	..		..		..		..		..		..	
38.....	..			2	..		..		..		..		..		..	
37.....	..		1	1	..		..		..		..		..		..	
36.....	..			2	..		..		..		..		..		..	
35.....	..			1	..		..		..		..		..		..	
34.....	..			1	..		..		..		..		..		..	
33.....	..		..		..		..		..		..		..		..	
32.....	..		..		..		..		..		..		..		..	
31.....	2		..		..		..		..		..		..		..	
30.....	1			1	..		..		..		..		..		..	
29.....		1	..		..		..		..		..		..		..	
28.....		1	..		..		..		..		..		..		..	
27.....	..		..		..		..		..		..		..		..	
26.....	..		..		..		..		..		..		..		..	
25.....	1		..		..		..		..		..		..		..	
Average length.	29.2	28.5	43.8	42.8	52.8	56.1	65.0		73.0		72.0	64.0			94.0	
	28,8		43,2		54,4		65,0		73,0		68,0				94,0	

80—90 cm. when 5—6 years old. The size of the 0-gr. is at the end of July, according to measurements made on-board the "Thor" 5—7 cm., and the average size should then be abt. 6 cm. From the few (6) specimens of the I-gr. with the average size of 29,0 cm. and ranging in length from 25 to 31 cm., we can hardly get any right idea of the true size of the group; but from all that I have seen of fish of this kind on the south coast, I think I shall not be far wrong in computing the common size of this group to be 25—30 cm., at the time in question and the average annual increase in length abt. 22 cm. — Concerning the other age-groups, more complete particulars are given in the Tables. The II-gr. (almost exclusively found in Table 3) ranges in length (both sexes taken together) from 35 to 52 cm., the average size being 43,8 cm. and the average annual increase in length abt. 17 cm.[2] The III-gr. (not numerous) ranges from 44 to 74 cm., has the average size 55,9 cm. and the annual increase abt. 13 cm. The IV-gr. ranges from 51 to 83 cm., average size 66,1, annual increase 10,2 cm. The V-gr. varies in length from 60 to 87 cm., average size 75,6 cm., annual increase 9,4 cm. The VI-gr. ranges from 60 to 87, average size 81,6, annual increase 6 cm. At this size both sexes have reached maturity (as will be treated more fully later on), and after that the growth becomes ever slower and more irregular. Most rapid is the growth in the two first years, being about 20 cm. each year, and as the growth mostly takes place in the 6 warmer months, May-October, it must rise to perhaps 3—4 cm. in the warmest months. In this respect the cod on the South coast agree pretty well with those of the Faroe Isles and of the North Sea.[3]

[1] Among this material were some gutted fish, with their reproductive organs removed, rendering them indeterminable as to the sex. These specimens are put intermediately in their respective columns in the Table.

[2] It must be remembered, that fish dealt with in Table 3 were taken in the sommer than the fish from the other places on the south coast, and therefore had attained a greater size (c. 1—2 cm.), than the other fish, which fact of course influences the average size of the younger groups.

[3] Drechsel, Foredrag under den 1ste nordiske Fiskehandler- og Havfiskerikongres. København 1912, p. 28. — Strubberg:

The following table, which includes all fish from the south coast, except the few more than nine years old, will show all the particulars given above, and also those concerning the groups VII—IX.

Age groups	0	I	II	III	IV	V	VI	VII	VIII	IX
Variation in length	abt. 3	25—31	30—52	44—74	51—83	60—87	64—97	70—105	81—110	74—108
Average length	abt. 6	29,0	43,8	55,9	66,1	75,6	81,6	89,8	93,6	93,9
Annual increase		abt. 24	15	12,9	10,2	9,4	6,0	8,1	3,8	0,3

β. The South-west coast.

The material from this section comprises 640 specimens treated of in the following 3 Tables. Besides these I have examined about 180 specimens af various age, captured in the autumn and winter-months outside or inside Faxa Bay. And to this I can add a great amount of material belonging to the 0- and I-groups taken and measured by SCHMIDT and the author in Faxa Bay and by the author in Breidafjord. The results will be shown in the following 3 Tables.

On glancing at these 3 Tables embracing the material from the south-west coast, the lack of the 0-gr., and the scarcity of the I-gr. will be conspicuous, as was the case with the corresponding groups on the South coast, at that for the same reason: the common fishing implements do not catch fish of smaller size than the II-group. In despite of this, however, I have, concerning the 0-gr., obtained fairly representative material during my investigations in Faxa Bay and Breidafjord in the summers 1908—09[1]. In July and August I caught over 400 cod of this group in shallow water (20—0 m.) in hauls to the shore by the Danish eel-seine (perhaps the smallest specimens have escaped through the meshes). The particulars of these specimens are as follows:

Locality and time of capture	Number of specimens	Size, cm	Average size
North-Breidafjord, Aug. 12.—16. 1908	129	4—8	5,1
South-Breidafjord, July 6.—20. 1909	99	3—5,5	4,4
Faxa Bay (Hvalfjord), July 24.—Aug. 18. 1909	198	4—8	5,5

From these it will be seen that the size ranges from 3 to 8 cm. and the average size is about 5 cm., a little larger for the specimens from Faxa Bay. Regarding the I-gr. I have only examined 20, 12—20 cm. specimens caught in Breidafjord, July 6th to Aug. 16th, and 34 taken in Faxa Bay (Skerjafjord and Hafnarfjord) in the first half of August. But in the last-mentioned fjord SCHMIDT has taken a great many by eel-seine, July 5th—7th, 1904; the length of these varied from 10 to 23 cm., the average length 14,3 cm. Later on (in the later half of July and the first half of August) he provided 206 codlings caught on handline in the fjord; and as their length was 15—27 cm., average 19,5 cm., I regard the small size of SCHMIDT's own specimens as primarily due to the earlier season, and probably also to a lesser depth. The specimens recorded in the Table range in size from 16 to 26 cm., with an average length of 20,3 (both sexes). The annual increase in length must thus be abt. 16 cm. — The II-gr. (rather scarce) ranges from 26 to 38 cm., with an average length of abt. 12 cm. — The III-gr. is pretty well represented[2] and

Marking experiments with cod at the Faroes, Meddelelser fra Kommissionen for Havundersøgelser, Serie: Fiskeri, Bind V, Nr. 2, København 1916.

[1] Full particulars about these are given in Fiskirannsóknir 1908—1909.

[2] The material displayed in Table 2, being taken at a much earlier season, at the beginning of the growth-period, and almost entirely lacking in specimens of the first four age-groups, besides differing greatly in other respects from the other material, and thus not easily comparable with this, it will therefore be treated separately.

Table 1. Cod from Akranes, July—August 1917.

Age-groups	I	II	III	IV	V	VI	VII	VIII	IX.	X	XI	X-XI	XI-XII
Sex	♂ ? ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀
Length cm.													
116	..	..	..	..	..	..	..	..	..	..	1	..	..
115	..	..	..	..	..	..	..	..	..	..	..	..	..
114	..	..	..	..	..	..	..	..	..	1	..	..	..
113	..	..	..	..	..	..	..	..	..	..	..	..	..
112	..	..	..	..	..	..	..	..	..	..	..	..	..
111	..	..	..	..	..	..	..	..	..	..	..	..	..
110	..	..	..	..	..	..	..	..	..	..	..	1	..
109	..	..	..	..	..	..	..	..	1	..	..	..	..
108	..	..	..	..	..	..	..	..	..	..	..	..	..
107	..	..	..	..	..	..	..	..	..	..	..	..	..
106	..	..	..	..	..	..	..	..	..	..	..	..	..
105	..	..	..	..	..	..	..	..	..	..	..	..	..
104	..	..	..	..	..	..	..	..	..	..	..	..	..
103	..	..	..	..	..	..	..	..	..	..	..	..	1
102	..	..	..	..	..	..	..	..	..	..	..	..	..
101	..	..	..	..	..	..	..	..	..	..	..	..	..
100	..	..	..	..	..	..	..	1	..	..	..	..	..
99	..	..	..	..	..	..	..	1	..	..	..	..	..
98	..	..	..	..	..	..	..	..	..	..	..	..	..
97	..	..	..	..	..	..	..	..	..	..	..	..	..
96	..	..	..	..	..	..	1	..	..	..	..	..	..
95	..	..	..	..	..	..	..	..	1	..	..	..	..
94	..	..	..	..	..	..	..	..	..	..	..	1	..
93	..	..	..	..	..	..	..	..	..	..	..	..	..
92	..	..	..	..	..	..	..	..	..	..	..	..	..
91	..	..	..	..	..	..	..	..	..	..	..	..	..
90	..	..	..	..	..	..	..	..	..	..	..	..	..
89	..	..	..	..	..	..	1	..	..	..	..	..	..
88	..	..	..	..	..	..	..	..	..	..	..	..	..
87	..	..	..	..	..	..	2	..	..	..	..	..	..
86	..	..	..	..	..	1	..	1	..	..	..	..	..
85	..	..	..	..	..	..	..	1	..	..	..	..	..
84	..	..	..	..	..	..	1	..	..	..	..	..	..
83	..	..	..	..	..	..	1	..	..	..	..	..	..
82	..	..	..	..	1	..	1	..	..	..	..	..	..
81	..	..	..	..	..	..	..	..	..	..	..	..	..
80	..	..	..	..	..	..	..	..	..	..	..	..	..
79	..	..	..	..	1	..	..	..	..	..	..	..	..
78	..	..	..	..	..	..	..	1	..	..	..	..	..
77	..	..	..	..	..	..	..	..	..	..	..	..	..
76	..	..	..	..	..	..	..	..	..	..	..	..	..
75	..	..	..	..	..	1	..	..	..	..	..	..	..
74	..	..	..	..	..	..	..	..	..	..	..	..	..
73	..	..	..	..	..	..	..	..	..	..	..	..	..
72	..	..	..	..	..	..	1	..	..	..	..	..	..
71	..	..	..	..	1	..	..	..	..	..	..	..	..
70	..	..	..	..	1	..	..	..	..	..	..	..	..
69	..	..	..	1	1	..	..	..	..	..	..	..	..
68	..	..	..	1	1	..	..	..	..	..	..	..	..
67	..	..	..	..	..	..	..	..	..	..	..	..	..
66	..	..	..	1	..	..	..	..	..	..	..	..	..
65	..	..	..	1	..	..	..	..	..	..	..	..	..
64	..	..	..	1	..	..	..	..	..	..	..	..	..
63	..	..	..	1 1	..	..	..	..	..	..	..	..	..
62	..	..	..	..	..	..	..	..	..	..	..	..	..
61	..	..	..	1 2	..	..	..	..	..	..	..	..	..
60	..	..	..	2 1	1	..	..	..	..	..	..	..	..
59	..	..	..	1	..	..	..	..	..	..	..	..	..
58	..	..	1	1	..	..	..	..	..	..	..	..	..
57	..	..	1	..	..	..	..	..	..	..	..	..	..
56	..	..	2 1	1 1	1	..	..	..	..	..	..	..	..
55	..	..	..	2	2	..	..	..	..	..	..	..	..
54	..	..	1	2	..	..	..	..	..	..	..	..	..
53	..	..	1	..	1	..	..	..	..	..	..	..	..
52	..	..	2 5	3	..	..	..	..	..	..	..	..	..
51	..	..	2 4	2	..	..	..	..	..	..	..	..	..
50	..	..	1 5	2 3	1	..	..	..	..	..	..	..	..
49	..	..	3 2	1 1	1	..	..	..	..	..	..	..	..

Table 1 (continued).

Age groups	I		II		III		IV		V		VI		VII		VIII		IX		X		XI		X-XI		XI-XII	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																										
48	..		..		3	3		2	..		..		..		..		..		..		..		..		..	
47	..		..		8	3	1		..		..		..		..		..		..		..		..		..	
46	..		..		4	4	3	1	..		..		..		..		..		..		..		..		..	
45	..		..		4	5	1		..		..		..		..		..		..		..		..		..	
44	..		..		4	4		1	..		..		..		..		..		..		..		..		..	
43	..		..		3	4	1	1	..		..		..		..		..		..		..		..		..	
42	..		..		4	6	..		1		..		..		..		..		..		..		..		..	
41	..		..		2	3	..		..		..		..		..		..		..		..		..		..	
40	..		..		2	3	1	1	..		..		..		..		..		..		..		..		..	
39	..		..		3	2	..		..		..		..		..		..		..		..		..		..	
38	..		1		6	3	..		..		..		..		..		..		..		..		..		..	
37	..		..		5	1	..		..		..		..		..		..		..		..		..		..	
36	..		2		3	1	..		..		..		..		..		..		..		..		..		..	
35	..		4		3		..		..		..		..		..		..		..		..		..		..	
34	..	1	1		1		..		..		..		..		..		..		..		..		..		..	
33	..	3	2	4	1		..		..		..		..		..		..		..		..		..		..	
32	..	2	2	3			..		..		..		..		..		..		..		..		..		..	
31	..	4	3	1	1		..		..		..		..		..		..		..		..		..		..	
30	..	2	1	..			..		..		..		..		..		..		..		..		..		..	
29	..		1	..			..		..		..		..		..		..		..		..		..		..	
28	..	1	1	..			..		..		..		..		..		..		..		..		..		..	
27	..	..		..			..		..		..		..		..		..		..		..		..		..	
26	1	2	1	..			..		..		..		..		..		..		..		..		..		..	
25		1	..	..			..		..		..		..		..		..		..		..		..		..	
24		2	..	..			..		..		..		..		..		..		..		..		..		..	
23	2	1	..	..			..		..		..		..		..		..		..		..		..		..	
22	2	3	..	..			..		..		..		..		..		..		..		..		..		..	
21		1	..	..			..		..		..		..		..		..		..		..		..		..	
20	3	1	..	..			..		..		..		..		..		..		..		..		..		..	
19	1	1	..	..			..		..		..		..		..		..		..		..		..		..	
18		2	2	..	..		..		..		..		..		..		..		..		..		..		..	
17	4	1	..	..			..		..		..		..		..		..		..		..		..		..	
16		3	1	..	..		..		..		..		..		..		..		..		..		..		..	
Average length	19.5	22.0	31.9	33.0	43.3	44.0	53.1	53.9	61.1	62.2	75.0	86.0	75.5	87.1	85.0	90.7	102.0		114.0		116.0		102.0		103.0	
	20,3		32,4		43,6		53,6		61,4		80,5		84,7		89,6		102,0		114,0		116,0		102,0		103,0	

ranges from 31 to 58 cm., the average size is 44,4 cm. and the annual increase in length again abt. 12 cm. — The IV-gr. varies in length from 40 to 72 cm., average size 50,3 cm. and the annual increase abt. 6 cm. — The V-gr. ranges from 42 to 82 cm., with an average size of 61,4 and annual increase 13,5. — The VI-gr. (very scarce) ranges from 63 to 86 cm., average length 75,7 cm. and annual increase abt. 12 cm. The VII-gr. ranges from 72 to 96 cm.; average length 76,2 cm., annual increase only 0,6 cm. — Finally the VIII-gr. ranges from 77 to 100 cm.; average size 89,7 and annual increase 13,5 cm.; the last figures indicate, that the groups IV and VII are too poor to give any true idea of the growth.

The particulars given in the Tables 1 and 3 will be more easily recognisable from the following table:

Age-groups	0	I	II	III	IV	V	VI	VII	VIII
Variation in length	4—8	16—26	26—38	31—58	40—72	42—82	64—86	72—96	78—100
Average length	abt. 5,3	20,3	32,0	44,4	50,3	61,4	75,7	76,2	89,7
Annual increase		abt. 15	abt. 12	abt. 12	6,0	13,5	abt. 12	0,6	13,5

On glancing at the material in Table 2 (from the outer part of the Faxa Bay), it will easily be seen that fish belonging to various year-groups are relatively much larger than those displayed in the other tables, as also following table indicates.

Age-groups	III	IV	V	VI	VII	VIII	IX
Variation in length	63—71	59—80	66—91	70—104	77—109	83—109	98—102
Average length	65,7	70,6	78,1	83,1	89,1	92,7	94,0
Annual increase		4,9	7,5	5,0	6,0	3,6	1,3

Table 2. Cod from Faxa Bay, June 1909.

Age-groups	III		IV		V		VI		VII		VIII		IX		X		X—XI		XI—XII		XIII	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																						
112																						1
111																						
110																						
109									1			1										
108																			1			
107										1												
106																						
105																						
104								1														
103																	1					
102														1								
101										1												
100																						
99												2	1									
98												1				1						
97								1				1	1	1								
96									1		3	1	2									
95									1			1	1									
94									1	1		1			1							
93											1		2		1		1					
92												1										
91						1		1	1			1	1	1								
90									1		1			1								
89							1	1	2				1									
88						2	1	2	1		1		1		1							
87						1	1		3	1												
86						1	2	3	3	2	2											
85						2	1		3		2	1										
84					2		1	2	1													
83						1	2	1	1	1	1											
82						1	1	4														
81					2	1	2	1	1													
80				2	3		2	1														
79				2	2	1																
78			1		1	2																
77				1	4	1	1		1													
76			1	1	2																	
75			2		2		1	1														
74			1	1	2																	
73				1		2																
72		1	1	1			1															
71					1		1	1														
70			2		2	2	1															
69				1																		
68			1	2																		
67			3	1	1																	
66			1		1																	
65		1		2																		
64																						
63	2		1																			
62																						
61			2																			
60																						
59			1																			
Average length	63,0	68,5	68,8	72,7	76,2	80,8	81,1	85,0	87,8	92,5	89,5	95,9	93,7	94,7	91,7	98,0	98,0		107,0		112,0	
	65,7		70,6		78,1		83,1		89,1		92,7		94,0		93,2		98,0		107,0		112,0	

Table 3. Cod from Olafsvik, July 1916.

Age groups	II		III		IV		V		VI		VII		VIII		X		XI		XII		XIV		XV		XVI	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																										
115	..		..		..		..		..		..		..		..		..		..		..		1		..	
114	..		..		..		..		..		..		..		..		..		..		..		..		.	
113	..		..		..		..		..		..		..		..		..		..		..		..		.	
103	..		..		..		..		..		..		..		..		1		1		..		..		.	
102	..		..		..		..		..		..		..		..		..		..		..		..		.	
101	..		..		..		..		..		..		..		..		..		..		..		..		.	
100	..		..		..		..		..		..		..		1		..		..		..		..		..	
99	..		..		..		..		..		..		..		..		..		..		1		..			1
98	..		..		..		..		..		..		..		..		..		..		..		..		..	
97	..		..		..		..		..		..		..		..		..		..		..		..		.	
96	..		..		..		..		..		..		..		..		..		..		..		..		.	
95	..		..		..		..		..		..		..		..		..		..		..		..		.	
94	..		..		..		..		..		..		..		..		..		..		..		..		.	
93	..		..		..		..		..		..		..		..		..		..		..		..		.	
92	..		..		..		..		..		..		..		..		..		..		..		..		.	
91	..		..		..		..		..		..		..		..		..		..		..		..		.	
90	..		..		..		..		..		..		1		..		..		..		..		..		.	
89	..		..		..		..		..		..		..		..		..		..		..		..		.	
88	..		..		..		..		..		..		..		..		..		..		..		..		..	
87	..		..		..		..		..		..		..		..		..		..		..		..		..	
86	..		..		..		..		..		..		..		..		..		..		..		..		..	
85	..		..		..		..		..		..		..		..		..		..		..		..		..	
84	..		..		..		..		..		..		..		..		..		..		..		..		..	
83	..		..		..		..		1		..		..		..		..		..		..		..		.	
82	..		..		..		..		..		..		..		..		..		..		..		..		.	
81	..		..		..		..		..		..		..		..		..		..		..		..		..	
80	..		..		..		..		..		1		..		..		..		..		..		..		..	
79	..		..		..		..		..		..		..		..		..		..		..		..		..	
78	..		..		..		..		..		..		..		..		..		..		..		..		.	
77	..		..		..		..		..		..		..		..		..		..		..		..		.	
76	..		..		..		..		1		..		..		..		..		..		..		..		..	
75	..		..		..		..		..		..		..		..		..		..		..		..		..	
74	..		..		..		..		..		..		..		..		..		..		..		..		..	
73	..		..		..		1		..		..		..		..		..		..		..		..		..	
72	..		..		1		1		..		..		..		..		..		..		..		..		..	
71	..		..		..		1	1	..		..		..		..		..		..		..		..		..	
70	..		..		..		1	2	1		..		..		..		..		..		..		..		..	
69	..		..		..			1	..		..		..		..		..		..		..		..		.	
68	..		..		3		2		..		..		..		..		..		..		..		..		..	
67	..		..		..			2	..		..		..		..		..		..		..		..		.	
66	..		..		..		1	3	..		..		..		..		..		..		..		..		..	
65	..		..			2	1	3	..		..		..		..		..		..		..		..		..	
64	..		..		..		1	1	1		..		..		..		..		..		..		..		..	
63	..		..		..		1		..		..		..		..		..		..		..		..		..	
62	..		..		1			1	..		..		..		..		..		..		..		..		.	
61	..		..		2	1	1		..		..		..		..		..		..		..		..		..	
60	..		..			3	2	1	..		..		..		..		..		..		..		..		..	
59	..		.		1	1	2		..		.		..		..		..		..		..		.		..	
58	..		..		3	2		..	..		..		..		..		..		..		..		.		..	
57	..		..		2		1		..		..		..		..		..		..		..		..		.	
56	..		1		1	4		..	..		..		..		..		..		..		..		..		.	
55	.			1	1	2		1	..		..		.		..		..		..		..		..		.	
54	..		1		1		.		..		..		..		..		..		..		..		..		..	
53	..			2	2	1			..		..		..		..		..		..		..		.		.	
52	..		2		1				.		.		.		..		..		..		..		..		..	
51	..		1	1	.				..		.		.		.		.		.		..		..		..	
50	.		4	3	1				.		.		.		.		.		.		.		.		..	
49	..		1	1					..		..		.		.		.		.		.		.		..	
48	..		6	4		1			..		..		..		.		.		.		.		.		..	
47	..		1	3	..				..		..		.		.		.		.		.		.		..	
46	..		2	2		2			..		..		..		..		..		..		..		..		..	
45	..		5	4	..				..		..		..		..		..		..		..		..		..	
44	..		2	2	..				..		..		..		..		..		..		..		..		..	
43	..		6	2	..				..		..		..		..		..		..		..		..		..	
42	..			4	..				..		..		..		..		..		..		..		..		..	
41	..		1	2	..				..		..		..		..		..		..		..		..		..	
40	..		2	2	..		..		..		..		..		..		..		..		..		..		..	

Table 3 (continued).

Age groups	II		III		IV		V		VI		VII		VIII		X		XI		XII		XIV		XV		XVI	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm																										
39	..			1	..		..		..		..		..		..		..		..		..		..		..	
38	..		1	1	..		..		..		..		..		..		..		..		..		..		..	
37	..			1	..		..		..		..		..		..		..		..		..		..		..	
36	1			1	..		..		..		..		..		..		..		..		..		..		..	
35	..		..		..		..		..		..		..		..		..		..		..		..		..	
34	..		..		..		..		..		..		..		..		..		..		..		..		..	
33	1		..		..		..		..		..		..		..		..		..		..		..		..	
32	2	2	..		..		..		..		..		..		..		..		..		..		..		..	
31	1	1	..		..		..		..		..		..		..		..		..		..		..		..	
30	1	2	..		..		..		..		..		..		..		..		..		..		..		..	
29	3		..		..		..		..		..		..		..		..		..		..		..		..	
Average length	31,2	31,0	46,4	45,1	59,0	56,5	64,7	64,9	73,2		80,0		90,0		100,0		103,0		103,0		99,0		115,0		99,0	
	31,1		45,8		57,8		64,8		73,2		80,0		90,0		100,0		103,0		103,0		99,0		115,0		99,0	

The material agrees on the whole fairly well with that from the South coast and could be regarded as having immigrated from there. But I am more inclined to look at it partly as fish grown up at a greater distance from the shore (as will be more thoroughly treated under next head), under better conditions than the majority of other fish (Table 1 and 3), probably grown up in the fjords and inshore waters of the larger bays, where the conditions must be regarded as more difficult, especially during the colder season, partly as older fish emigrated from the inshore waters, as they successively reach the size of those living on offshore grounds. And it is conspicuous that those older age-groups are noticeably absent among the inshore material.

To the material in question can be added a large number of cod measured during the cruise of the "Thor" to Iceland in 1904 by Schmidt onboard a couple of Aberdeen trawlers in Faxa Bay, July 1st—7th. This large material, embracing 11134 cod of all sizes from 20 to 114 cm., is very representative, as showing what sort of cod trawlers usually catch on the offshore banks of Faxa Bay in the summer (see below, p. 33). It will easily be seen from the Fig. 6, p. 33, that the size of the majority of the fish in question lies between 80 and 90 cm., with two well marked age-groups (the III-gr.?) between 35 and 43 cm. and (the IV-gr.?) between 45 and 60 cm. Other (older) groups are present and fairly rich, especially one (the V-gr.?) between 65 and 75 cm., but the two youngest groups are predominant. When this material is compared with that shown in the three Tables above, it is evident, that it fills up a gap between the inshore and offshore fish.

For these various reasons I think it will be found justifiable to take all the material in question (the fish from the South-west coast) as a whole, and regard it as comparable with that from other sections. The following table will show the particulars concerning all the material in question.

Age-groups	0	I	II	III	IV	V	VI	VII	VIII	IX
Variation in length	3—8	16—26	26—38	31—72	40—80	42—91	64—104	72—109	78—109	88—109
Average length	abt. 5	20,3	32,0	46,1	59,5	70,7	82,1	87,9	92,0	94,4
Annual increase		abt. 15	12,3	10,4	13,4	11,2	11,4	5,8	5,7	0,3

γ. The North-west coast.

The material from this section embraces 560 specimens examined as to age and growth by the author. Besides this a great number of cod of the 0- and the I-group were caught in the fjords of the

North-west peninsula and surveyed during his motor boat-cruises in 1908, and fish of all age-groups were captured by SCHMIDT and his assistants during the cruises of the "Thor" in those waters during 1904. All this material will be considerated and the results shown in the following Tables.

Table 1. Cod from Patreksfjord, July—Aug. 1915.

Age groups	I		II		III		IV		V		VI		VII		VIII	
Sex	♂	? ♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																
87	..	..	..	..	..	..	..	..	..	1	..	..				
81	..	..	..	..	..	..	..	..	1		..	..				
80	..	..	..	..	..	..	..	..	1		..	..				
79	..	..	..	..	..	..	..	..	1		..	..				
78	..	..	..	..	..	..	..	..	..	..	..	..				
77	..	..	..	..	..	..	..	..	..	1	..	..				
76	..	..	..	..	..	..	..	1		3	..	..				
75	..	..	..	..	..	..	..	1	1		..	..				
74	..	..	..	..	..	..	..	..	..	..	..	..				
73	..	..	..	..	..	..	1		..		..	..				
72	..	..	..	..	..	..	1	3	..		..	..				
71	..	..	..	..	..	..	..		1	1	1		1			
70	..	..	..	..	..	..	..	1	..		..	..				
69	..	..	..	..	..	..	..	..	..		..	..				
68	..	..	..	..	..	..	1	3	..		..	..				
67	..	..	..	..	..	1	2		1		..	..				
66	..	..	..	..	..	..	1	2	..		..	..				
65	..	..	..	..	..	..	2		1		..	..				
64	..	..	..	..	..	..	1	1		1	..	..				
63	..	..	..	..	..	..	..		..		..	..				
62	..	..	..	..	..	1		1	..		..	..				
61	..	..	..	..	2	3		1	..		..	..				
60	..	..	..	..	2	1		1	..		..	..				
59	..	..	..	..	3	2	1		..		..	..				
58	..	..	..	..	3	2	..		..		..	..				
57	..	..	..	..	2		..		..		..	..				
56	..	..	..	..	2	6	..		..		..	..				
55	..	..	..	..	3	5	..		..		..	..				
54	..	..	..	..	3	4	..		..		..	..				
53	..	..	..	..	1	2	..		1		..	..				
52	..	..	1		1		..		..		..	..				
51	..	..	..		1	4	1		..		..	..				
50	..	..	..		..		..		..		..	..				
49	..	..	1		..		..		..		..	..				
48	..	..		1	2		..		..		..	..				
47	..	..	1	3	..		..		..		..	..				
46	..	..	1		..		..		..		..	..				
45	..	..	2	5		1	..		..		..	..				

Age groups	I		II		III		IV		V		VI		VII		VIII	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																
44	..		..			1	..		..		..		..		..	
43	..		..			3	..		..		..		..		..	
42	..		..			1	1		..		..		..		..	
41	..		..			4	..		..		..		..		..	
40	..		..		2		..		..		..		..		..	
39	..		..		1		..		..		..		..		..	
38	..		..		..		..		..		..		..		..	
37	..		1		..		..		..		..		..		..	
36	..		..		..		..		..		..		..		..	
35	..		1		1		..		..		..		..		..	
34	..		1		..		..		..		..		..		..	
33	..		1		..		..		..		..		..		..	
32	..		1	2	..		..		..		..		..		..	
31	..		2		..		..		..		..		..		..	
30	..		..		..		..		..		..		..		..	
29	..		..		..		..		..		..		..		..	
28	..		..		..		..		..		..		..		..	
27	..		..		..		..		..		..		..		..	
26	..		..		..		..		..		..		..		..	
25	..		..		..		..		..		..		..		..	
24	..		..		..		..		..		..		..		..	
23	..		..		..		..		..		..		..		..	
22	2		..		..		..		..		..		..		..	
21	1		..		..		..		..		..		..		..	
20	..		..		..		..		..		..		..		..	
19	..		..		..		..		..		..		..		..	
18	..		.		..		..		..		..		..		..	
17	6		..		..		..		..		..		..		..	
16	5		..		..		..		..		..		..		..	
15	8		..		..		..		..		..		..		..	
14	9		..		..		..		..		..		..		..	
13	6		..		..		..		..		..		..		..	
12	..		..		..		..		..		..		..		..	
11	2		..		..		..		..		..		..		..	
10	..		..		..		..		..		..		..		..	
Aver.length		15,2	32,8	33,0	33,2	44,0	43,8	55,7	44,1	66,8	55,4	73,2	55,9	71,0	65,2	71,0	68,0	71,0	75,1		71,9		71,0		71,0	

A glance at these 3 Tables which show all the fish examined from the North-west coast will make it clear that they supplement each other, the material from the inshore waters (the fjords) containing relatively more of very young fish, while that from the offshore banks has more older and relatively larger fish. Fish of the 0-gr. are quite absent here, as in the material from the South and South-west coast, but in 1908 I caught a great number (6768) of them in the Isafjord Deep, both pelagically and at the bottom in the latter half of July. Their size varied from 2 to 6 cm., the average length being abt. 3,8 cm. SCHMIDT took 28, 4—6 cm. long specimens, average length 4,3, in Patreks fjord Aug. 25th—26th. The average length of this group should then (in the first half of August) be abt. 4 cm. — Of the I-gr. there are only 39 specimens (taken with eel-seine) from Patreks fjord (Table 1), varying in length from 11 to 22 cm., the average length being 16,2. But in 1908 I captured (with eel-seine) 950 specimens (ranging in length from 8 to 20 cm., average length abt. 13 cm.) in Isafjord Deep, in company with the above mentioned 0-gr.-specimens, and SCHMIDT took 23 specimens 9—17 cm. long, average length 15,4 cm., in Patreksfjord, together with the specimens of the 0-gr. The range of variation in length of all specimens

Table 2. Cod from N-W.fjord-banks, July 1915.

Age groups	II		III		IV		V		VI		VII		VIII		VIII		XVI-XVII
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂ ♀
Length cm.																	
120	..		..		..		..		..		..		..		..		1
:																	
100	..		..		..		..		..		..		1		..		..
99	..		..		..		..		..		..		1		1		..
98	..		..		..		..		..		..		..		..		..
97	..		..		..		..		..		..		1		1		..
96	..		..		..		..		..		..		1	1	..		..
95	..		..		..		..		..	1	..		1	1	..		..
94	..		..		..		..		..	..	..		..		..		..
93	..		..		..		..		..	..	..		..		..		..
92	..		..		..		..		..	..	..		2		..		..
91	..		..		..		..		..	..	..		1		..		..
90	..		..		..		..		..	..	..		1		..		..
89	..		..		..		..		..	..	..		1		..		..
88	..		..		..		..		..	..	..		1		..		..
87	..		..		..		..		2		..		1	1	..		..
86	..		..		..		..		1		2			1	..		..
85	..		..		..		..		..		..		1		..		..
84	..		..		..		..		..	1				1	..		..
83	..		..		..		..		1	..	..		..		..		..
82	..		..		..		..		1	..	..		..		..		..
81	..		..		..		..		..	..	..		..		..		..
80	..		..		..		..		..	1			..		..		..
79	..		..		..	1			..	1			..		..		..
78	..		..		..		1		..	..	..		..		..		..
77	..		..		..		..		..	..	..		..		..		..
76	..		..		..		..		..	..	..		..		..		..
75	..		..		..		..		1	1	..		..		..		..
74	..		..		..		1		2		..		..		..		..
73	..		..		..		..		2	1	..		..		..		..
72	..		..		..	1			..		..		..		..		..
71	..		..		..		2		..		..		..		..		..
70	..		..		..	1			..		..		..		..		..
69	..		..		..	1			..		..		..		..		..
68	..		..	1		1	1		..		..		..		..		..
67	..		..		..	1	1		..		..		..		..		..
66	..		..		..		..		..		..		..		..		..
65	..		..	2		1	1		..		..		..		..		..
64	..		..	1		2	2		..		..		..		..		..
63	..		..	3	2		1		..		..		..		..		..
62	..		..	3	3	..			..		..		..		..		..
61	..	1		1			1		..		..		..		..		..
60	..		..	2	4	..			..		..		..		..		..
59	..		..	4	1	..			..		..		..		..		..
58	..		..	5	1	..			..		..		..		..		..
57	..		2	6	2	..			..		..		..		..		..
56	..	1		1	2	..			..		..		..		..		..
55	..		..	1		..			..		..		..		..		..
54	..		..	2	3	..			..		..		..		..		..
53	..		1	1		..			..		..		..		..		..
52	..	1	1	1		..			..		..		..		..		..
51	..		2		2	..			..		..		..		..		..
50	..	1	2	..		..			..		..		..		..		..
49	..	1		..		..			..		..		..		..		..
48	..	3	1	..		..			..		..		..		..		..
47	..		1		1	..			..		..		..		..		..
46	..	3	1	..		..			..		..		..		..		..
45	..	1		1		..			..		..		..		..		..
44	..	1		1		..			..		..		..		..		..
43	..	..		..		..			..		..		..		..		..
42	..	..		..		..			..		..		..		..		..
41	..	..		..		..			..		..		..		..		..
40	..			..		..			..		..		..		..		..
39	..	1..		..		..			..		..		..		..		..
38	..	..		..		..			..		..		..		..		..
37	..	..		..		..			..		..		..		..		..
36	..	..		..		..			..		..		..		..		..
35	1	..		..		..			..		..		..		..		..
34	..	..		..		..			..		..		..		..		..

Age groups.	II		III		IV		V		VI		VII		VIII		IX		XVI-XVII
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂ ♀
Length cm																	
33	..		..		..		..		..		..		..		..		..
32	..		1		..		..		..		..		..		..		..
31		1	..		..		..		..		..		..		..		..
30	..		..		..		..		..		..		..		..		..
29	..		1		..		..		..		..		..		..		..
Aver.length	35,1	31,0	46,2	51,1	58,0	57,4	68,7	67,8	78,6	78,2	85,0		90,6	90,4	97,0	99,0	120,0
	33,0		48,2		58,0		68,2		78,5		85,0		90,5		98,0		120,0

Table 3. Cod from Isafjord Deep, July 1915.

Age groups	II		III		IV		V		VIII	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm										
87		..		..		..		..		1
:										
75		..		..		1		..		..
:										
64		..		..	2			..		..
63		..		..		..		..		..
62		..		..		..		..		..
61		..		..		..		1		..
60		..		..		..		..		..
59		..		..		..		..		..
58		..		..	2			1		..
57		..		..		..		..		..
56		..		..	1			..		..
55		..		..		1		1		..
54		..		..		1		..		..
53		..		..	1	2		..		..
52		..		..		..		..		..
51		..		..	1		1			..
50		..		..		3	1			..
49		..		..	2	1		..		..
48		..	1		1	1		1		..
47		..	3			..		..		..
46		..		1		2		..		..
45		..		1	3		1			..
44		..	2	1		..		..		..
43		..	2	2	1			..		..
42		..	2			..		..		..
41		..	4	2		..		..		..
40		..	3	1		1		..		..
39	1		4	2		..		..		..
38		..	2	5		..		..		..
37		1		3		..		..		..
36		1	3	1	1			..		..
35		..	1	1	1			..		..
34	3	1	1	2		..		..		..
33	4	4	1	3	1			..		..
32	9	3		1		..		..		..
31	15	11	1			..		..		..
30	7	8	1			..		..		..
29	11	15	1	2		..		..		..
28	7	15		4		..		..		..
27	8	7		2		..		..		..
26	5	2	..			..		..		..
25	3	3	..			..		..		..
24	..		..			..		..		..
23		1	..			..		..		..
Average length	29,8	29,2	39,5	35,8	48,9	51,5	48,7	55,5		87,0
	29,5		37,6		50,0		52,3		87,0	

Table 1. Cod from Eyjafjord, July 1920.

Age groups	I		II		III		IV		V		VI		VII		VIII		IX		X		XII		XIII	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																								
112																								1
:																								
103																						1		
102																								
101																								
100																	2	1						
99																								
98																2								
97																								
96															1	1								
95																								
94																								
93																								
92																								
91																								
90														1					1					
89																								
88													1											
87													1											
86																								
85														1										
84														1	1									
83																								
82														2										
81											1			2										
80											1		1	1		2								
79													1											
78														1										
77																								
76													1											
75													1	1										
74									1					1										
73												1	2	1										
72											1	1	3											
71											1	1	1											
70																								
69										1		1		3										
68																								
67										1														
66																								
65										1	2													
64																								
63								1	1															
62									1	1														
61									1	1														
60									1				1											
59							2		1															
58							1		2	2														
57									2															
56							1	1		4														
55									3	1														
54							1	1	1															
53							2	1	1	1	1													
52							2	1																
51							1		2	1														
50							3	2																
49							4	1																
48					1		3	2																
47							5	4	1															
46							6	1																
45							6																	
44							5	4																
43					1		2	1																
42					1		2	4																
41				2			1	2	1															
40							2	7																
39					1		1	2																
38					1		1																	

Table 1 (continued).

Age groups	I	II		III		IV		V		VI		VII		VIII		IX		X		XII		XIII	
Sex	♂ ? ♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																							
37	..	..		1	5	1	1	..		..		..		..		..		..		..		..	
36	..	..		3	1	1	1	..		..		..		..		..		..		..		..	
35	..	..		1	2		1	..		..		..		..		..		..		..		..	
34	..	..		1	1	..		..		..		..		..		..		..		..		..	
33	..	..		1	2		1	..		..		..		..		..		..		..		..	
32	..	..		2	1	..		..		..		..		..		..		..		..		..	
31	..	1	1		1	..		..		..		..		..		..		..		..		..	
30	..		4	1		..		..		..		..		..		..		..		..		..	
29	..	4	4	1	1	..		..		..		..		..		..		..		..		..	
28	..	4	4	2	4	..		..		..		..		..		..		..		..		..	
27	..	7	7	3	1	..		..		..		..		..		..		..		..		..	
26	..	12	9		1	..		..		..		..		..		..		..		..		..	
25	..	10	9		1	..		..		..		..		..		..		..		..		..	
24	..	23	9	..		..		..		..		..		..		..		..		..		..	
23	..	15	5	1		..		..		..		..		..		..		..		..		..	
22	..	5	2	..		..		..		..		..		..		..		..		..		..	
21	..	4	3	..		..		..		..		..		..		..		..		..		..	
20	4	1		..		..		..		..		..		..		..		..		..		..	
19	3	..		..		..		..		..		..		..		..		..		..		..	
18	10	..		..		..		..		..		..		..		..		..		..		..	
17	11	..		..		..		..		..		..		..		..		..		..		..	
16	11	..		..		..		..		..		..		..		..		..		..		..	
15	8	..		..		..		..		..		..		..		..		..		..		..	
14	13	..		..		..		..		..		..		..		..		..		..		..	
13	6	..		..		..		..		..		..		..		..		..		..		..	
12	2	..		..		..		..		..		..		..		..		..		..		..	
Average length		24,7	25,7	32,2	34,0	46,4	43,9	55,2	58,8	69,6	71,0	75,2	77,0	90,0	87,6	100,0	100,0	90,0		103,0		112,0	
	15,9	25,1		33,0		45,2		57,4		70,1		76,1		88,0		100,0		90,0		103,0		112,0	

will thus be 8—22 cm., the average length abt. 15 cm., and the annual increase in length 11 cm. — The II-gr. (abundant in Table 2[1], very scarce in the others) ranges in length from 23 to 38 cm.; average size 30,6 cm., and annual increase 15,6 cm. — The III-gr. (most numerous in Table 2) reaches in length from 27 to 61 cm., average length 40,7 and annual increase 10 cm. — The IV-gr. ranges from 40 to 75 cm., average length 55,4 cm., annual increase 14,7 cm. — The V-gr. (very poor and small-sized in Table 2) ranges from 45 to 79 cm., average length 65,4 cm., annual increase 10 cm. — The VI-gr., (absent in Table 2) ranges from 64 to 87 cm.; average lenght 76,3 and annual increase 10,9 cm. — The VII-gr. (absent in Table 2, otherwise very scarce) ranges from 71 to 95 cm., average length 83,0 cm., annual increase 6,7 cm. — The VIII-gr. (also absent in Table 2, and scarce for the rest) ranges from 71 to 100 cm., average length 89,5, annual increase 6,5 cm.

The particulars given in these 3 Tables will more easily be noticed from the following table.

Age-groups	0	I	II	III	IV	V	VI	VII	VIII
Variation in length	2—6	8—22	23—38	27—61	40—75	45—79	53—87	71—95	71—100
Average length	abt. 4	15,0	30,6	40,7	55,4	65,4	76,3	83,0	89,5
Annual increase		abt. 11,0	15,6	10,1	14,7	10,0	10,9	6,7	6,5

When the fish here recorded from the North-west coast are compared with those from the South-west coast, it will be seen, that the growth is remarkably slower (the average size (lenght) of each year-group considerably less) than in the case of the fish from the South-west coast. The irregularity in the

[1] Of fish taken at 8—20 m. depth 12 % only were over 2 years old (most of these 3 years), but of those from 75—95 m. only 35 % were of the II-gr., the remainder older i. e. the majority of the II-gr. was taken in shallow water.

Table 2. Cod from Skjalfandi and Thistilfjord, July—Aug. 1913.

Age groups.....	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XVII	XVIII -XX
Sex.....	?	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀	♂ ♀
Length cm.																
150.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
149.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
148.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
147.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
146.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
.																
116.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
115.....	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
114.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
113.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
112.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
111.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
110.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
109.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
108.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
107.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
106.....	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
105.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
104.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
103.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
102.....	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..
101.....	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..
100.....	..	..	..	..	..	..	..	..	..	1	2	..	..	..	..	..
99.....	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..
98.....	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
97.....	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
96.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
95.....	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..
94.....	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
93.....	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..
92.....	..	..	..	..	..	..	..	..	..	1 1	..	..	..	..	..	..
91.....	..	..	..	..	..	..	..	2	..	1	..	..	..	..	..	..
90.....	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..
89.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
88.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
87.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
86.....	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
85.....	..	..	..	..	..	..	1	1	..	..	1	..	..	..	..	..
84.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
83.....	..	..	..	..	..	..	..	..	1 1	..	..	..	..	..	..	..
82.....	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
81.....	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
80.....	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
79.....	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
78.....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
77.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
76.....	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..
75.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
74.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
73.....	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
72.....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
71.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
70.....	..	..	..	..	..	1 1	..	..	..	..	..	..	..	..	..	..
69.....	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..
68.....	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..
67.....	..	..	..	..	..	1 1	..	..	..	..	..	..	..	..	..	..
66.....	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
65.....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
64.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
63.....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
62.....	..	..	..	..	2 1	1	1	..	..	..	..	..	..	..	..	..
61.....	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
60.....	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..
59.....	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..
58.....	..	..	..	..	1 3	..	..	..	..	..	..	..	..	..	..	..
57.....	..	..	..	..	1 1	..	..	..	..	..	..	..	..	..	..	..
56.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
55.....	..	..	..	1 1	..	..	..	..	..	..	..	..	..	..	..	..

Table 2 (continued).

Age groups.....	I	II		III		IV		V		VI		VII		VIII		IX		X		XI		XII		XIII		XIV		XVII		XVIII -XX	
Sex.....	?	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm																															
54	..	..		..			1	..		..		..		..		..		..		..		..		..		..		..		..	
53	..	..		..		..		1	1	..		..		..		..		..		..		..		..		..		..		..	
52	..	..		..		1		1	2	1		..		..		..		..		..		..		..		..		..		..	
51	..	..		..		1		2	4	..		..		..		..		..		..		..		..		..		..		..	
50	..	..		..		2		1		..		..		..		..		..		..		..		..		..		..		..	
49	..	..		..		3		1	2	..		..		..		..		..		..		..		..		..		..		..	
48	..	..		..		4	3	2	2	..		..		..		..		..		..		..		..		..		..		..	
47	..	..		1	1	1	1	3	1	..		..		..		..		..		..		..		..		..		..		..	
46	..	..		..		3	2	2	2	..		..		..		..		..		..		..		..		..		..		..	
45	..	..		2		1	3	1		..		..		..		..		..		..		..		..		..		..		..	
44	..	..		1	2	4	4	2		..		..		..		..		..		..		..		..		..		..		..	
43	..	..		..		4	7		2	..		..		..		..		..		..		..		..		..		..		..	
42	..	1		1		2	7	1		..		..		..		..		..		..		..		..		..		..		..	
41	..	..		1	1	7	6	..		..		..		..		..		..		..		..		..		..		..		..	
40	..	..		2	5	3	4	1	1	..		..		..		..		..		..		..		..		..		..		..	
39	..	..		6	4	1	2	..		..		..		..		..		..		..		..		..		..		..		..	
38	..	1		1	9		2	..		..		..		..		..		..		..		..		..		..		..		..	
37	..	..		6	5	2	1	..		..		..		..		..		..		..		..		..		..		..		..	
36	..	..		5	6	..		..		..		..		..		..		..		..		..		..		..		..		..	
35	..	..		3	5		1	..		..		..		..		..		..		..		..		..		..		..		..	
34	..		1	1		..		..		..		..		..		..		..		..		..		..		..		..		..	
33	..	2			2	..		..		..		..		..		..		..		..		..		..		..		..		..	
32	..	..			1	..		..		..		..		..		..		..		..		..		..		..		..		..	
31	..	2		1		..		..		..		..		..		..		..		..		..		..		..		..		..	
30	..	1	1	..		..		..		..		..		..		..		..		..		..		..		..		..		..	
29	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
28	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
27	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
26	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
25	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
24	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
23	..	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
22	1	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
21	2	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
20	1	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
19	4	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
18	6	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
17	13	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
16	27	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
15	23	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
14	16	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
13	2	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
12	2	..		..		..		..		..		..		..		..		..		..		..		..		..		..		..	
Average length .		34,0	32,0	37,8	38,1	43,3	43,8	50,0	51,0	65,9	67,1	71,8	73,2	85,0	92,3	82,2	90,0	91,5	96,0	96,8		95,0	99,0	115,0		106,0		109,0		148,0	
	15,9	33,7		38,8		43,6		50,5		66,5		72,5		89,5		84,5		91,9		96,8		97,7		115,0		106,0		109,0		148,0	

annual increase in some of the year-groups is most likely due to insufficient and heterogenous material. As in the case of the fish from the South-west coast, here also the fact is obvious, that the younger age-groups of fish from offshore grounds are of relatively larger size than those from the fjords, as will easily be seen, on comparing Table 2 with Table 3.

δ. The North coast.

The material from this section is the most copious, numbering 1098 specimens of examined fish, and is, as recorded above, collected in different places of the coast, especially the eastern part of it. To this I can add a great number of fish of the 0-gr. and the I-gr., taken by Schmidt and the author in different places, as will be recorded below. The particulars concerning this material will be seen in the following Tables.

Table 3. Cod from Tangar, July 1920.

Age groups	IV		V		VI		VII		VIII		IX		X		XI		abt. XV		abt. XIX	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																				
140	..		..		..		..		..		..		..		..		..		1	
:																				
125	..		..		..		..		..		..		..		..			1	..	
:																				
117	..		..		..		..		..		..		..		..			1	..	
:																				
110	..		..		..		..		..		..		..		..		1		..	
109	..		..		..		..		..		..		..		..		..		..	
108	..		..		..		..		..		..		..		..		..		..	
107	..		..		..		..		..		..		..		..		1		..	
106	..		..		..		..		..		..		..		..		..		..	
105	..		..		..		..		..		..		..		..		..		..	
104	..		..		..		..		..		..		..		..		..		..	
103	..		..		..		..		..		..			1	..		..		..	
102	..		..		..		..		..		..		1		..		..		..	
101	..		..		..		..		..		..		..		..		..		..	
100	..		..		..		..		..		..		..		..		..		..	
99	..		..		..		..		..		..		..		1		..		..	
98	..		..		..		..		..			1	..		1		..		..	
97	..		..		..		..		..		..		..		..		..		..	
96	..		..		..		..		..	1		1	..		..		..		..	
95	..		..		..		..		..		..		..		..		..		..	
94	..		..		..		..			1	..		..		..		..		..	
93	..		..		..		..			1	2	1	..		..		..		..	
92	..		..		..		..		..		..		..		..		..		..	
91	..		..		..		..		..		..		..		..		..		..	
90	..		..		..		..		..		..		..		..		..		..	
89	..		..		..			1	2	2	..		..		..		..		..	
88	..		..		..		..		..		1		..		..		..		..	
87	..		..		..		..		2	1	..		..		..		..		..	
86	..		..		..		..		..		..		..		..		..		..	
85	..		..		..		..		..			1	..		..		..		..	
84	..		..		..		3			1	..		..		..		..		..	
83	..		..		..		1		3		..		..		..		..		..	
82	..		..		..			1	1	2	..		..		..		..		..	
81	..		..		..		..		1	2		1	..		..		..		..	
80	..		..		..		1		2	1	..		..		..		..		..	
79	..		..		..		..		..		..		..		..		..		..	
78	..		..		1	1		2	..		..		..		..		..		..	
77	..		..		1	1	1		1		..		..		..		..		..	
76	..		..		..		1	1	1		..		..		..		..		..	
75	..		..		1	2	1	1	..		..		..		..		..		..	
74	..		..		1		1			1	..		..		..		..		..	
73	..		..		..		1	2	1		..		..		..		..		..	
72	..		..		1	1	1	1	..		..		..		..		..		..	
71	..		..		1			1	1		..		..		..		..		..	
70	..			1	1		..		..		..		..		..		..		..	
69	..		..		..		1	1	..		..		..		..		..		..	
68	..		1		..		..		..		..		..		..		..		..	
67	..		..		..		1		..		..		..		..		..		..	
66	..		..		..		..		..		..		..		..		..		..	
65	..			1	..		..		..		..		..		..		..		..	
64	..		..		..		..		..		..		..		..		..		..	
63	..			1	..		..		..		..		..		..		..		..	
62	..		2		1		..		..		..		..		..		..		..	
61	1		1		..		..		..		..		..		..		..		..	
60	..		..			1	..		..		..		..		..		..		..	
59	..		..		..		..		..		..		..		..		..		..	
58		1	..		..		..		..		..		..		..		..		..	
57	..		1		..		..		..		..		..		..		..		..	
56	..		..		..		..		..		..		..		..		..		..	
Average length	61,0	58,0	62,0	66,0	72,4	72,8	76,8	76,0	80,4	85,2	91,3	90,6	102,0	103,0	98,5		108,5	121,0	140,0	
	59,8		63,5		72,4		76,4		83,2		90,9		102,5		98,5		114,5		140,0	

As in all earlier cases the 0-gr. is entirely absent; I have nevertheless material enough for a pretty accurate account of the size of it at the very same time at which the older groups were taken. SCHMIDT caught fish of this group as follows:

Locality	Date	Number	Var. in size	Aver. size
Höfn at Horn	24. VIII. 1904	124	4—7 cm	5,1 cm
Reykjarfjord	23. VIII. 1904	311	3—8 -	4,8 -
Siglufjord	15. VIII. 1904	16	4—6 -	4,9 -
Skjalfandi Bay	31. VII. 1905	107	3—6 -	abt. 4,0 -
Siglufjord	8. VIII. 1905	25	4—6 -	4,8 -

The author found them abundant in the Steingrimsfjord, Hrutafjord and other inlets of the Huna Bay, July 30th to Aug. 10th, 1908[1]. 2334 of them were measured and varied in length from 2,8 to 6,6 cm., while the average size was 4,5 cm. This size can be considered as an average size of the 0-gr. at the beginning of August on the western part of the North coast, where not a few individuals of c. 3 cm. length are still leading a pelagic life in the fjord at that time, while the corresponding figure for the eastern part of this coast will hardly exceed 3,0 cm. as there is at the same time a great number of pelagic fry of 1,0 to 3,0 cm. length. — According to Tables 1 and 2 the variation in length in the I-gr. is 12 to 22 cm., the average length 15,9 and the annual increase abt. 12 cm. Besides this, both SCHMIDT and the author have captured a great number of cod of this group at the localities quoted above, SCHMIDT nearly 2000 in Eyjafjord and Siglufjord, varying in length from 10 to 21 cm., average length abt. 14,5, and I 560 in the Huna Bay, varying from 10 to 21 cm., average length abt. 12 (11,8) cm. These figures show that those obtained by age-determination are rather high, and the average size (15,9 cm.) should be somewhat reduced, say to 15,0 cm. — The II-gr. (also only present in the Tables 1 and 2, and very scarce in the last one) ranges from 20 to 42 cm., average length 25,4 cm., and the annual increase abt. 10,4. — The III-gr. (not very numerous and only present in same two Tables) ranges from 23 to 48 cm. average length 36,9 cm. and the annual increase 11,5 cm. — The IV-gr. the most numerous of all (though nearly absent in Table 3) ranges from 33 to 63 cm., average, length 44,6 cm. and annual increase 7,7 cm. — The V-gr. reaches from 40—75 cm., average length 53,1 cm., annual increase 8,5 cm. — The VI-gr. ranges in length from 52 to 81 cm. average, length 69,5 cm., annual increase 6,1 cm. — The VII-gr. ranges from 59 to 88 cm., average length 75,6 cm., annual increase 6,1 cm. — The VIII-gr. varies from 71 to 98 cm., average length 85,7 cm., annual increase 12,1 cm. The IX-gr. ranges from 76 to 100 cm., average size 90,2 cm., annual increase 4,5 cm. — The X-gr. finally ranges from 90 to 103 cm., average length 95,8 cm., annual increase 5,8 cm. — The higher groups are disregarded[2].

Following table will show the particulars, given in the above Tables, more clearly.

Locality	0	I	II	III	IV	V	VI	VII	VIII	IX	X
Variat. in length.	2,8—6,6	12—22	20—42	23—48	33—63	40—75	52—81	59—89	71—98	76—100	90—103
Average length .	abt. 3,0	abt. 15,0	25,4	36,9	44,6	53,1	69,5	75,6	85,7 ..	.. 90,2	95,8
Annual increase.		abt. 12,0	10,4	11,5	7,7	8,5	16,4	6,1	12,1	4,5	5,8

If these figures are compared with those in the corresponding table concerning the material from the North-west coast it will be noticed that the rate of growth is approximately the same, though there are

[1] In one of them, the Bitrufjord, the author took, at Ospakseyri, abt. 5000 in a single haul with the eel-seine, which shows how exceedingly numerous the 0-group then was in these waters.

[2] Regarding the material treated in Tables 1 and 2 I must point out, that all specimens of the I-gr. and the II-gr., 14 of the III-gr. and 1 of the V-gr. in Table 1 were taken at 20 to 0 m. depth, at Svalbardseyri, the majority of the III-gr. and the IV-gr. at 25 to 45 m. all the others in 25—90 m. depth, at Hrisey. Of the specimens in Table 2 all those of the I-gr. are taken at 2—0 m. depth at Husavik; the II-gr. and the majority of the III-gr. and the IV-gr. at 20 m. in Skjalfandi and Thistilfjord, the rest at 110—150 m. in Skjalfandi and Axarfjord.

some irregularities in the annual increase in the VI- and VIII-groups, probably due to paucity of material. The fish from the offshore grounds (Tangar, Table 3, p. 23) shows here quite the same feature as did the fish from the South-west and the North-west coasts: the average size of the year-groups, especially the V-gr., the VI-gr. and the VII-gr. is proportionally larger, but unfortunately material of younger groups for comparison is lacking.

ε. The East coast.

The material from this section of the coast is the most scarce, embracing only 443 specimens of fish examined. To this however, I can add a great number of fish of the I-gr., captured and examined by SCHMIDT during the cruises of the "Thor" in the years 1903—05, cruises I myself took part in. All this material is shown in the Table, p. 26—27 having really been taken at one locality only, one of the fjords of the East coast and the adjacent rather shallow offshore fishing grounds.

As in the other material the 0-gr. also here is altogether lacking, but the absence is due to the circumstance that no specimens of this group are to be found in the fjords of the East coast at this time (the first half of August). On the other hand SCHMIDT has taken some pelagic specimens (10—50 mm.) at the same time (July 20th—Aug. 7th) off the northern part of the coast (between Glettinganes and Langanes). Young fish at the bottom are not to be found before the close of August. For this reason I only take the 0-gr. in parenthesis. Its variation in length is 1 to 5 cm. and the average size about 2,5 cm. — The I-gr. is hardly present in the Table, only 4 specimens. Whether this was due to a real absence of the group in the fjord I operated in (I did not see many of them at the piers, where they are usually abundant in July and August as in the other fjords), or to the fact, that I failed to get my eel-seine in time from another stopping place on the coast, I cannot say. SCHMIDT has taken a great number of these in April—July in Seydisfjord and Eskifjord[1], and the author in Eskifjord, Northfjord and Faskrudsfjord, 1910[2]. July 28th 1905 SCHMIDT took abt. 230 specimens[3] in Seydisfjord, varying in length from 10 to 16 cm., average length 13,7 cm., annual increase abt. 10 cm. — The II-gr. is very rich; it ranges from 16 to 33 cm., the average length is 22,4 cm. and the annual increase again abt. 10 cm. — The III-gr. is rather scarce; it ranges from 25 to 42 cm., average length 33,4 cm., annual increase 11 cm. — The IV-gr. (fairly numerous) ranges from 34 to 59 cm., average length 43,9 cm., annual increase 10,5 cm. — The V-gr. ranges from 39 to 73 cm., average length 56,4 cm., annual increase 12,5 cm. — The VII-gr. (poor as the remaining groups) ranges from 60 to 78 cm., average length 71,4 cm., annual increase 15,0 cm. (but doubtless really less than this). — The VII-gr. ranges from 71 to 89 cm., average length 80,7 cm., annual increase 9,3 cm., and the VIII-gr. from 72 to 92 cm., average length 83,1 cm., annual increase 2,4 cm. Higher groups are too few in number for comparison.

The particulars dealt with above will be more easily noticeable in following table.

Age-groups	0	I	II	III	IV	V	VI	VII	VIII
Variation in length	(1—5)	10—16	16—33	25—57	34—59	39—73	60—78	71—89	72—92
Average length	abt. 2,5	abt. 13,7	22,4	33,4	43,9	56,4	71,4	80,7	83,1
Annual increase	abt. 10,0	abt. 10,0	abt. 10,0	abt. 11,0	10,5	12,5	9,3	9,3	2,4

When these figures are compared with the corresponding ones for the North coast, it is obvious that the growth is remarkably slower in the former case, the average size (length) and the annual increase of the fish belonging to each group being smaller.

[1] Fiskeriundersøgelser ved Island etc., p. 62, Tab. VIII.

[2] Fiskirannsóknir 1909—1910, p. 43—44.

[3] As in this case like others above noted them material was not age-determined, the number of them cannot be exactly given.

Table 1. Cod from Northfjord. August 1920.

Age groups	I	II		III		IV		V		VI		VII		VIII		IX		X		XI		XIII-XIV		about XX		about XXV	
Sex	?	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																											
150	..	..		..		..		..		..		..		..		..		..		..		..		..			1
128	..	..		..		..		..		..		..		..		..		..		..		..			1	..	
119	..	..		..		..		..		..		..		..		..		..		..		..			1	..	
101	..	..		..		..		..		..		..		..			1	..		..		1		..		..	
100	..	..		..		..		..		..		..		..		..		..		1		..		..		..	
92	..	..		..		..		..		..		..			2	..		..		..		..		..		..	
91	..	..		..		..		..		..		..			1	..		1		..		..		..		..	
90	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
89	..	..		..		..		..		..		1		..		..		..		..		..		..		..	
88	..	..		..		..		..		..		..		1		..		..		..		..		..		..	
87	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
86	..	..		..		..		..		..		..	2	..		..		..		..		..		..		..	
85	..	..		..		..		..		..		2		..		..		..		..		..		..		..	
84	..	..		..		..		..		..			1		1	..		..		..		..		..		..	
83	..	..		..		..		..		..			2	1	1	..		..		..		..		..		..	
82	..	..		..		..		..		..		1	1	..		..		..		..		..		..		..	
81	..	..		..		..		..		..		1	1	..		..		..		..		..		..		..	
80	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
79	..	..		..		..		..		..		1	1		1	..		..		..		..		..		..	
78	..	..		..		..		..		2		..		1		..		..		..		..		..		..	
77	..	..		..		..		..		..		1		..		..		..		..		..		..		..	
76	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
75	..	..		..		..		..		1		..		..		..		..		..		..		..		..	
74	..	..		..		..		..	1			1	1	..		..		..		..		..		..		..	
73	..	..		..		..		1		1		1		..		..		..		..		..		..		..	
72	..	..		..		..		..		..		..		1	1	..		..		..		..		..		..	
71	..	..		..		..			1	1		1		..		..		..		..		..		..		..	
70	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
69	..	..		..		..		1		..		..		..		..		..		..		..		..		..	
68	..	..		..		..		2		1		..		..		1		..		..		..		..		..	
67	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
66	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
65	..	..		..		..		1	1		1	..		..		..		..		..		..		..		..	
64	..	..		..		..		..		..		..		..		..		..		..		..		..		..	
63	..	..		..		..		1	1	..		..		..		..		..		..		..		..		..	
62	..	..		..		..		..	3	..		..		..		..		..		..		..		..		..	
61	..	..		..		..		2		..		..		..		..		..		..		..		..		..	
60	..	..		..		..		1	1	1		..		..		..		..		..		..		..		..	
59	..	..		..			1		2	..		..		..		..		..		..		..		..		..	
58	..	..		..		..		1	2	..		..		..		..		..		..		..		..		..	
57	..	..			1	..		3	3	..		..		..		..		..		..		..		..		..	
56	..	..		..		1		4	2	..		..		..		..		..		..		..		..		..	
55	..	..		..		..			4	..		..		..		..		..		..		..		..		..	
54	..	..		..			2	3		..		..		..		..		..		..		..		..		..	
53	..	..		..			3	2		..		..		..		..		..		..		..		..		..	
52	..	..		..		..		1		..		..		..		..		..		..		..		..		..	
51	..	..		..		2	1		2	..		..		..		..		..		..		..		..		..	
50	..	..		..		2	2		1	..		..		..		..		..		..		..		..		..	
49	..	..		..		2	3		1	..		..		..		..		..		..		..		..		..	
48	..	..		1		6	2		1	..		..		..		..		..		..		..		..		..	
47	..	..		..		4	4	..		..		..		..		..		..		..		..		..		..	
46	..	..		..		8	1		1	..		..		..		..		..		..		..		..		..	
45	..	..		..		3	5	..		..		..		..		..		..		..		..		..		..	
44	..	..		..		4	8	..		..		..		..		..		..		..		..		..		..	
43	..	..		..		4	9	..		..		..		..		..		..		..		..		..		..	
42	..	..			1	4	6		2	..		..		..		..		..		..		..		..		..	
41	..	..		..		3	5	1		..		..		..		..		..		..		..		..		..	
40	..	..		..		4	1	1	1	..		..		..		..		..		..		..		..		..	
39	..	..			1	2	2	..		..		..		..		..		..		..		..		..		..	
38	..	..	1	1		1	2	..		..		..		..		..		..		..		..		..		..	
37	..	..			1	3	3	..		..		..		..		..		..		..		..		..		..	
36	..	..			2	2	3	..		..		..		..		..		..		..		..		..		..	
35	..	..	1	2		3	1	..		..		..		..		..		..		..		..		..		..	
34	..	..	1	1			1	..		..		..		..		..		..		..		..		..		..	

Table 1 (continued).

Age groups	I	II		III		IV		V		VI		VII		VIII		IX		X		XI		XIII-XIV		about XX		about XXV	
Sex	?	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
Length cm.																											
33	..	1		1	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
32	..	1		1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
31	..		2	2		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
30	..	1	1		3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
29	..	2	3	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
28	..		4	1	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
27	..	5	3	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
26	..	8	8	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
25	..	11	6	2		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
24	..	8	6	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23	..	6	6	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22	..	10	8	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21	..	9	8	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20	..	11	13	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
19	..	9	6	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
18	..	7	3	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
17	..	6	3	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
16	..	3	3	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	..	..		..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
14	3	..		..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
13	1	..		..		..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Average length		22,2	22,7	32,8	34,1	43,8	44,0	57,7	55,2	68,2	74,0	79,6	82,0	80,2	84,7	68,0 [2]	101,0	91,0		100,0		101,0		123,5		150,0	
	13,7	22,4		33,4		43,9		56,4		71,4		80,7		83,1		84,5		91,0		100,0		101,0		123,5		150,0	

d. Summary.

Having now given a full account of the material from each of the five sections of the coast, it remains to look at it as a whole for clearer comparison. The variation in length however and the annual increase of the single year-groups will be left out of consideration, and the average length only be dealt with. As in the special surveys, the highest year-groups will be omitted. This general survey is as follows:

Age-groups	0	I	II	III	IV	V	VI	VII	VIII	IX
South coast	abt. 6,0	29,0	43,8	55,9	66,1	75,6	81,6	89,8	93,6	93,9
South-west coast	— 5,0	20,3	32,0	46,1	59,5	70,7	82,1	87,9	92,0	94,4
North-west coast	— 4,5	15,2	30,6	40,7	55,4	65,5	76,3	83,0	89,5	(98,0)
North coast	— 3,5	15,0	25,4	36,9	44,6	53,1	69,8	75,6	84,4	90,2
East coast	— 2,5	12,7	22,8	33,4	43,9	56,4	71,4	80,7	83,1	(84,5)
Mean size	— 4,5	14,4	29,0	43,0	51,6	63,9	78,3	83,1	89,5	91,3

A hasty glance at this survey will at once make it clear, that the growth of the cod is subject to a definite rule: it is most rapid on the South coast and gradually decreases as we turn to the right round the country (in the same direction as the main current flows) being slowest on the East coast. This difference in rate of growth is not the same in all age-groups; it rises from East to South to 100—120% in the 0-—II-gr., to 60—70% in the III-—V-gr., abt. 15% in the VI-gr., 10—12% in the VII-—IX-gr. and finally the difference dissappears i. e. the cod will grow to the same size on the East coast as on the South coast, but it takes a much longer time. In this respect the cod agrees with the halibut, which also, according to JESPERSEN[1], displays a more rapid growth on the South-west

[1] Op. cit. p. 16. [2] Infested with *Lernæa*.

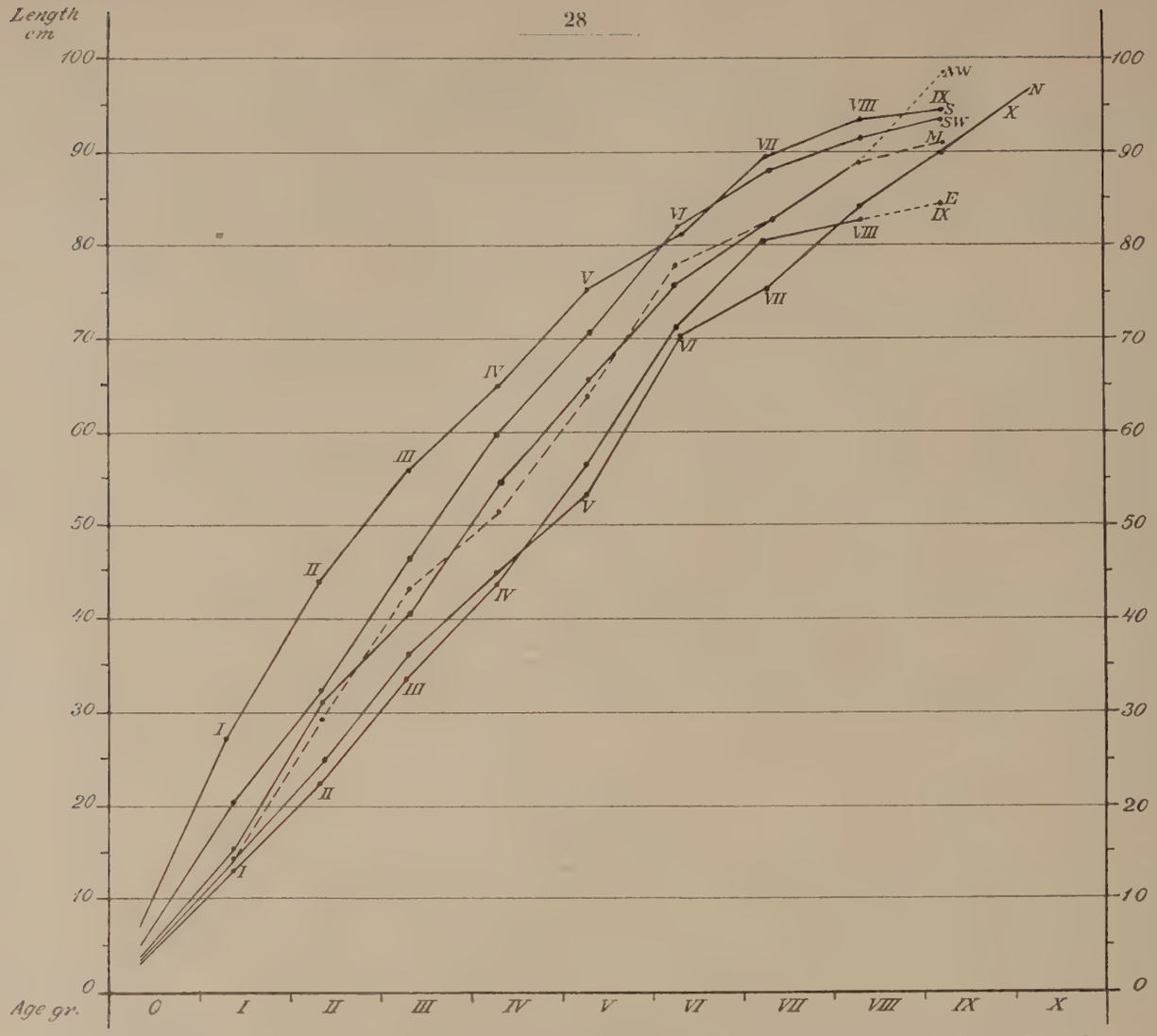

Fig. 3. Growth-curves for Cod from different sections (S., SW., NW., N., E.) of Iceland. The coarsely broken line, *M*, which partly coincides with the NW. curve is the mean-curve.

than on the East coast. This circumstance is, no doubt, in both cases, due to the difference in the temperature of the sea on different coasts[1].

Locality	Date	Depth	Temperature	
			surface	bottom
3 miles off Ingolfshöfdi	April 16	59 m	5,6°	6,9°
3 — off Gardskagi	— 21	34 -	4,9°	5,3°
17 — S. of Skor	— 22	70 -	2,5°	2,4°
12 — NW. of Straumnes	— 23	75 -	1,5°	1,9°
3 — SE. of Grimsey	— 23	113 -	1,7°	1,7°
9 — SSE. of Langanes	— 24	65 -	1,0°	1,1°
6 — S. of Gerpir	— 27	73 -	1,2°	1,1°
4 — S. of Eystra Horn	— 27	67 -	5,3°	5,3°
10 — E. of Westman Isles	July 16	75 -	11,8°	10,5°
3 — off Veidios	— 17	75 -	11,2°	7,5°
2 — off Gerpir	— 18	76 -	4,5°	2,5°
6 — SE. of Langanes	— 20	80 -	7,5°	3,2°
3 — W. of Grimsey	— 22	76 -	8,4°	4,8°

following examples, taken from the journals of the "Thor", during her summer-cruise 1904. These figures show very clearly how the temperature rises in both directions from the East to the South coast, both at the bottom as at the surface.

[1] Cfr. Nautisk Meteorologisk Aarbog, issued by the Meteorol. Institute, Copenhagen. — It is a well-known fact that the temperature in the sea is highest on the South coast and gradually decreases round Iceland in the above mentioned direction, being lowest on the East coast. The average surface-temperature of each month, all round the island, and its changes throughout the year is very clearly laid down in the charts in the cited annuals. But the difference in temperature also reaches down to the bottom (i. e. to the waters on the fishing grounds), as will be seen from the

The most expressive influence of this difference in temperature on the life of the cod (as the halibut and many other fishes) is the fact that, roughly speaking, no spawning takes place in the colder water on the North and East coast[1].

The diagram, fig. 3, gives a graphical picture of the above recorded growth and age of the cod. This sketch is, like the age and growth determinations, on the whole, based upon measurements for the greater part carried out in the latter half of July or the first half of August, 3—4 months after the hatching of every fish in question (April being the chief spawning month) and do not therefore express the size of single groups at the close of each of the years of their life, as little as do the various tables given above, but the size when each group has advanced 3—4 months into the next year. If the more rapid growth of the warmer season commenced at the same time all round the country, the calculation could easily be reduced to the hatching of the fish, but as the summer growth commences at different times on different coast (on the South and South-west coast probably early in May, on the North and East coast not long before the beginning of July), and the phenomenon being very little studied on the whole, I must rest satisfied with the arrangement mentioned above.

Finally I must emphasize the fact that I do not regard the figures given above as exact expressions of the growth, as they are, for most of the year groups from the various sections, based upon too few individuals, and probably some misreadings may have taken place, so they will by further examination of a larger material, be somewhat modified; yet I hope, they will hold good on the whole.

In the above comparison of the growth of the fish from different sections of the coast I have only taken the first 8—10 year-groups into consideration. But besides the fish of that age, wich constitutes the great bulk of the material examined, there are several individuals of still higher age and greater size, and some few which reach a length of 120 to 140 cm., and as far as I can read their age with any certainty 18—20 years old. The record as to size and age is set by a female cod from the East coast, which is 150 cm. long and about 25 year old[2].

I will mention it as a rather common fact, that such very big (and old) specimens of cod, the majority females, are often caught in a considerable number in the summer on certain offshore banks on the East and North coast, or more singly or "isolated" among young fish in shallow waters near the coast all round the country, but especially on the East coast (cfr. Table 1, p. 26).

3. Sexual difference in size and age.

Save for the 0-gr., where determination of the sex is altogether excluded, and the I-gr. where it is in many cases (e. g. if the material is not quite fresh) very difficult or impossible, all the material examined has been determined as to sex, and in the various age-columns in the tables each sex has been recorded separately throughout, as will be seen from the various tables. The results are summarised in the following table:

Age-groups	II		III		IV		V		VI		VII		VIII		IX	
Sex	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
South coast	44,1	42,8	56,5	55,5	66,5	67,1	75,2	76,5	80,9	84,0	87,8	89,2	91,0	96,5	93,5	94,8
South-west coast	31,5	32,6	44,7	47,5	59,6	59,1	69,7	72,1	79,4	85,0	86,8	90,2	89,1	94,0	93,7	97,2
North-west coast	27,9	31,5	42,1	40,8	55,2	55,5	64,4	66,3	77,1	73,8	83,0	—	88,8	90,0	97,0	99,0
North coast	25,0	26,0	35,6	36,5	45,6	44,0	53,7	54,9	69,1	70,1	75,3	75,9	82,7	86,2	88,6	91,6
East coast	22,2	22,7	32,8	34,1	43,8	44,0	57,7	55,2	68,2	74,0	79,6	82,0	80,2	84,7	—	

[1] Cfr. SCHMIDT, Skrifter udgivne af Komm. for Havundersøgelser, No. 1, Kh. 1904.

[2] A still bigger cod, 152 cm. long, was captured on the bank of Glettinganes (East coast) and measured by SCHMIDT in 1904. The author has been told of several very big specimens, up to a "fathom-long", captured in different places round the coast.

As will be seen, fish over 9 years old have been excluded, specimens being too few for comparison. It is obvious that there is a marked difference in growth between the sexes, the growth of the females on the whole being more rapid[1], especially at the age when maturity is beginning and onward, as the fish grows older. This difference, which amounts to 3—13% in various age-groups, is a simple consequence of the fact that the females are larger than the males when growing mature (see below), and this difference in size lasts onward up to the highest age and size observed. Of 35 specimens of the X-gr. 16 are males, 19 females; of 15 specimens of the XI-gr. 6 are males, 9 females and of 24 specimens of all older groups 7 are males, 17 females. From the Tables it can be seen that the females of these groups are in most cases larger than the males, when both sexes are present in the same year-group. To these age-determined specimens I can add 25 cod, 120—130 cm., caught off Reydarfjord (the East coast) Aug. 10th 1920 and examined by the author; only 2 of them were males[2]. Of 15 cod captured off Grindavik 1904 only 3 were males[3]. Yet it must be stated, that one of the biggest cod recorded (148 cm.) was a male. This scarcity of large males can hardly be considered as a mere accident owing to an insufficient material, but as an expression of the circumstance that the males do not on the whole reach as high an age and as great a size as the females.

Concerning the size and age at which the Iceland cod become mature the size has previously been fixed by Schmidt and the author. Schmidt has investigated the matter as to the females and found the smallest (youngest) mature fish abt. 70 cm. long[4], and according to his journals he has never found mature males under 60 cm.

The author has also had his attention constantly drawn to this matter and found half-ripe males 49—54 cm.[5] long; at 60 cm. many are ripe, but the bulk of the males only attain maturity at 70 cm., and perhaps some individuals may be found immature at this or even greater size. The smallest ripe female I have found, was 59 cm.[5]; but ripe females under 70 cm. are very rare and most of them are not mature under 80 cm. On the other hand I have found virgin individuals up to 90 cm. This has especially been the case with a good many 7 to 9 year-old specimens from the North and the East coast[6].

When the size of the fish growing up to maturity is compared with the sizes of the age-groups, it appears, that the age of earliest maturity is in the case of the males 4—5 years (rarely 3) on the South and South-west cost, 5—6 years on the North and East coast and sometimes more; in the case of females 5—6 years (rarely 4) on the South and South-west coast, 6—8 years (exceptionally 5 or 9) on the North and the East coast. The North-west coast keeps in both cases an intermediate position.

4. The weight of the cod, and the age.

When collecting material for age-determination I not only measured the length of every fish, but also weighed it. I have then obtained a large material for determining the weight of the fish in proportion to its length and further the average weight of the single age-groups and of both sexes. True, the weight of two fishes of the same length, nay of the same fish in various condition, may be very different, as it depends upo many factors, firstly on the degree of fatness, then on the quantity of food in the stomach, the state of development of the reproductive organs etc., but the figures obtained in this way give a very clear idea of the matter. Unfortunately I have neither had time nor leisure to work out

[1] The few exceptions may be regarded as quite accidental or due to insufficient material.
[2] Fiskiraunsóknir 1919—1920, p. 49.
[3] — 1905, p. 114.
[4] Fiskeriundersøgelser, p. 66—67.
[5] Fiskiraunsóknir 1905, p. 113—114.
[6] — 1919—1920, p. 57—60.

1. Size and weight of Cod from the South coast
(cfr. Tables 1—3, p. 8—10).

Age year	Number of specimens	Variation of		Average	
		length cm.	weight g.	length cm.	weight[1] g.
12	2	96—108	6750—14000	107,0	10400
11	3	92—108	8000—12500	101,0	10000
10	14	91—114	5600—11500	102,0	9500
9	16	73—108	3500—11500	93,9	8000
8	49	81—113	5200—12500	93,6	7500
7	61	69—105	2900—11500	89,8	6500
6	92	64— 97	2400— 8500	81,6	5500
5	59	60— 91	1700— 7250	75,6	4200
4	56	51— 83	1100— 5000	66,1	2700
3	50	44— 76	500— 3400	55,9	1700
2	87	28— 52	190— 1800	43,8	1100
1	6	25— 31	50— 500	29,0	300

[1] All the figures are approximate.

2. Size and weight of Cod from the North coast
(cfr. Tables 1—3, p. 19—23).

Age year	Number of specimens	Variation of		Average	
		length cm.	weight g.	length cm.	weight[1] g.
19	3	110—148	10000—27500	132,7	20000
15	3	107—125	9500—17000	116,3	13450
13	2	112—115	11000—13000	113,5	12000
12	5	95—103	7000—15000	99,0	10000
11	9	85—105	5000— 9500	96,2	8000
10	13	72—109	3000— 9500	95,8	7000
9	19	76—102	3250—13000	90,2	6000
8	45	70— 98	3700— 7700	85,7	5000
7	59	59— 89	1600— 6400	75,6	3600
6	40	52— 83	1000— 4500	69,5	3000
5	91	40— 74	600— 3700	53,1	1300
4	187	33— 63	300— 1700	44,6	800
3	184	23— 50	100— 1100	36,9	400
2	138	16— 31	30— 300	25,4	125
1	162	13— 21	12— 130	15,0	35

[1] All the figures are approximate.

the calculations necessary to give a full account of the matter, but I have in my Reports to the Government given particulars of these things concerning the material from the single localities. On a basis of these I shall, in stead of giving some general results, take the material from two opposite sides of the country, o: from the South coast as representative of the warmer sea and from the North coast for the colder sea, considering it sufficient for the purpose. Perhaps it would have been most proper to use the "intermediate" material from the North-west coast, as it would have given good average figures, but I find it too poor to be representative enough. The material from the East coast agrees fairly well with that from the North coast.

It will easily be seen that the weight of the fish increases rapidly in proportion to increasing length, and as the length increases most quickly in the younger age, the increment of weight of course is also most rapid at that time. Thus for instance a ten-year-old fish adds only about 500 g. to its weight, which is 9000 g. (abt. 5,5 %) in the warmer sea, and about 1000 g. to 7000 g. (14 %) in the colder sea, while it adds one year to its age, when the corresponding figures are 1000 g. to 1700 g. (abt. 59 %) in the warmer, 400 to 400 (100 %) in the colder sea, while the age rises from 3 to 4 years. At a still younger age (1—2 years) the increment is enormous, 390—400 % (three-four-fold). — This circumstance is of a very great importance in connection with the capture of a very young fish without economic value: one or two years higher age could mean 2—5 times greater weight. As the average size of corresponding age-groups is much greater in the warmer than in the colder sea, as stated above, the weight of each group must be much greater still. This will be obvious, from a glance at the tables above and the graph. Fig. 4.

5. The age of the cod and the fisheries.

It is a well-known fact that cod-fisheries are carried out on a very large scale in the waters of Iceland by native and foreign fishermen at every time of the year, but at different seasons on different sides of the country. On the South and the South-west coast the principal season is the first third of the

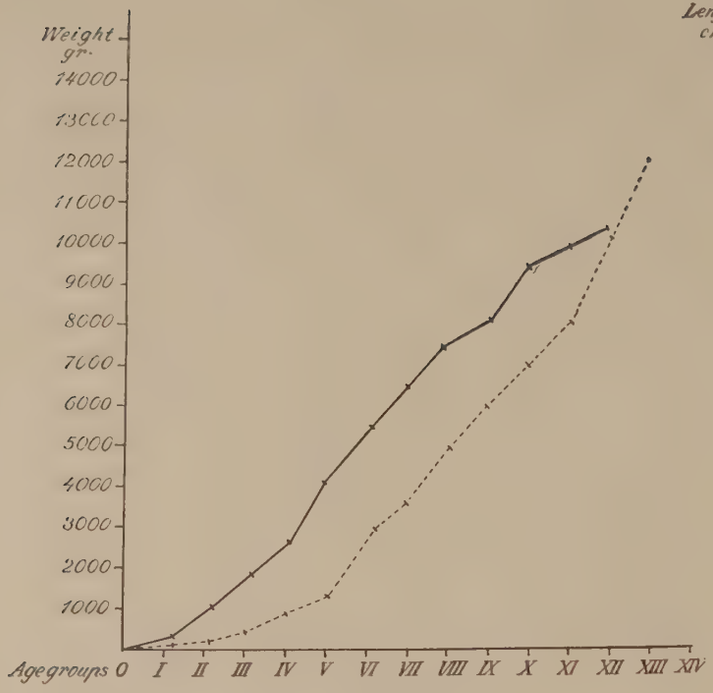

Fig. 4. Approximate weight-curves for cod.
—ı— South coast, ----ı---- North coast.

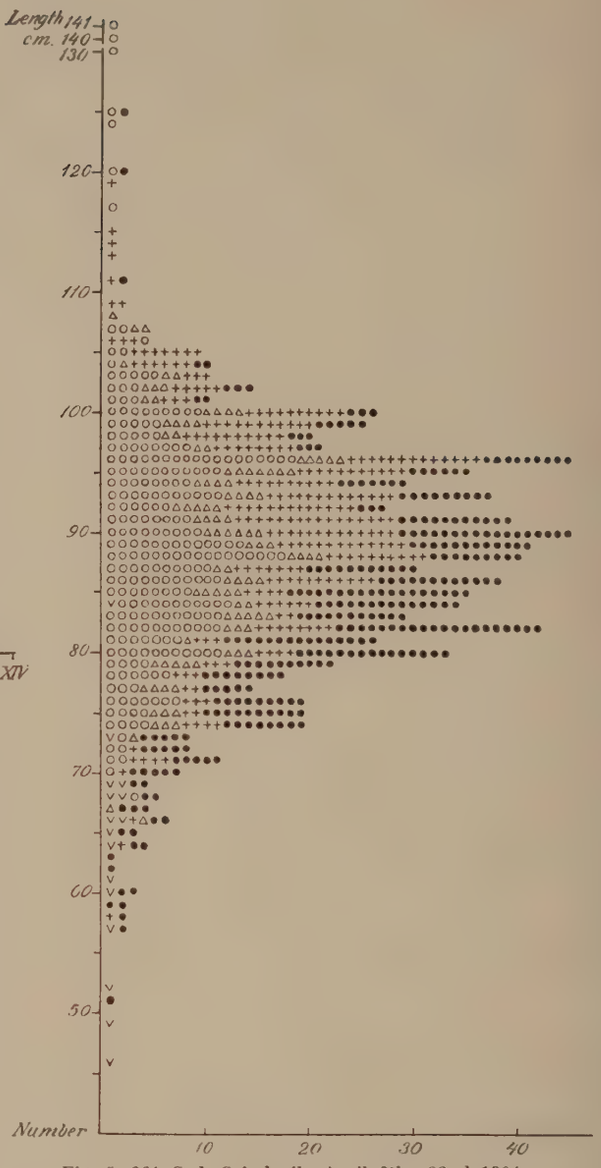

Fig. 5. 961 Cod, Grindavik, April 6th—22nd 1904.
• males, ∨ virgin, ○ spent, △ spawning, + spawned females.

year (January—April), when the most important of all Icelandic fisheries take place, based upon the spawning of the cod in these tracts in the spring (March—May), while the summer and the autumn seasons are of far less importance. On the North-west coast the main season last from the middle of April to January, while February—March is a dead period. On the North and East coasts there is, broadly speaking, only one long season during the warmer part of the year (June—November). — The fishing apparatus is the common ottertrawl, long lines (those used by foreigners mostly with hooks No. 1, but those used by the natives with hooks No. 7—8), handlines (mostly with large hooks) and gillnets (meshes commonly 10,5 cm. between knots). Small-meshed seines for shore hauls and bottom-seine (Bundgarn) are used in some fjords.

It is evident, that these different implements will catch cod of nearly every size and age, except the 0-gr., the smaller ones of the I-gr. and the smallest of the II-gr. Generally speaking fish exceeding 18—20 cm. and 50—100 g., no matter what age, can be caught by the small-meshed seines. The largest individuals of the I-gr., grown up on offshore grounds on the South and South-west coast, in the colder waters those of the II-gr., and the larger ones of the III-gr. will in many cases also be the spoil of the ottertrawl.

The practical fisherman does not want to catch these small-sized, valueless cod, he wants to get the large ones, and the bulk of the fish caught is of course of a greater size. The best idea of the capt-

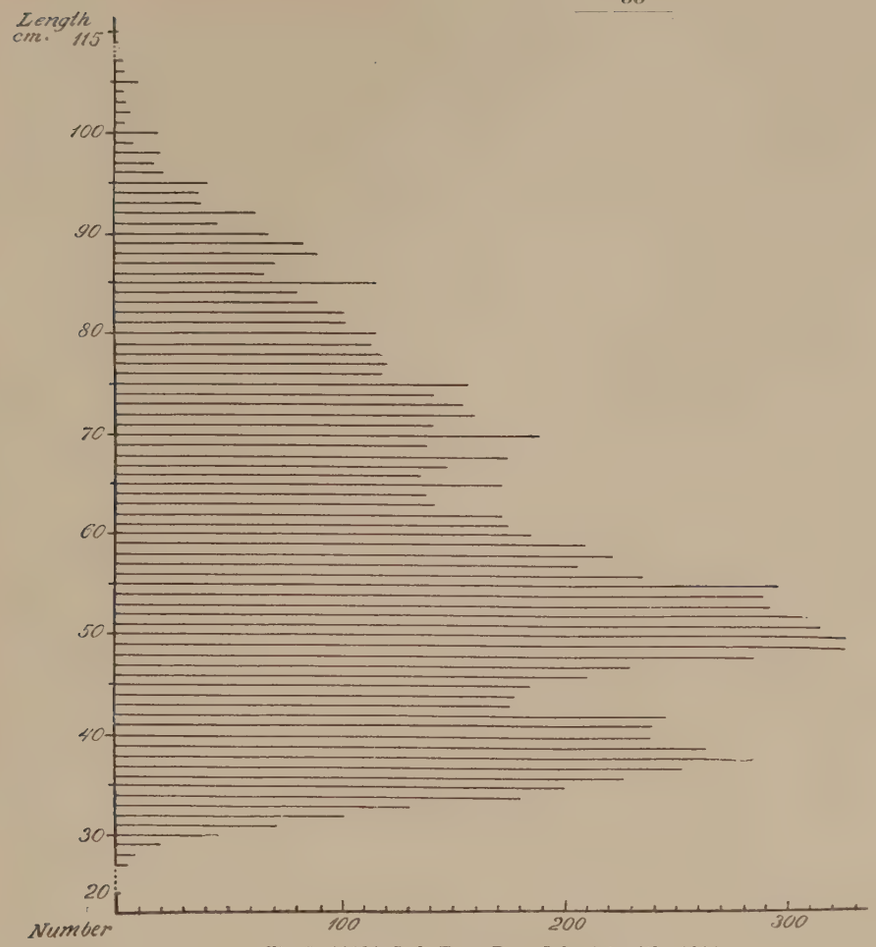

Fig. 6. 11134 Cod, Faxa Bay, July 1st—4th, 1904.

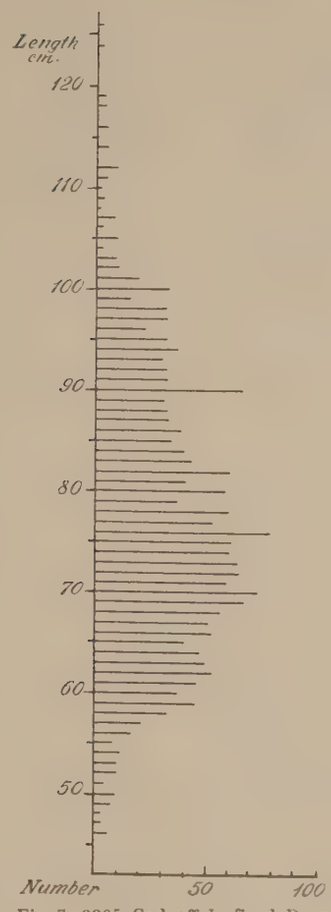

Fig. 7. 2205 Cod off Isafjord Deep June 4th—11th, 1904.

ured cod, as to age and size, may be gained from the various tables above and from the records given below of some catches made by various commercial fishing vessels at different seasons and in different places.

1) 961 cod caught by an open boat (a the catch made) off Grindavik (the South coast), April 6th—22th, 1904 (and referred to above), in 75—110 m., were measured and examined at my request for the purpose of knowing the minimal size of mature (spawning) cod. This catch is very representative of cod captured in the main season on the banks of the South coast. This fish ranges in size from 46 to 141 cm., but the majority from 70 to 105 cm., and, with few exceptions, mature, and therefore, no doubt, 4—5 years old or more[1] (Fig. 5).

2) 11134 cod caught by Aberdeen trawlers July 1st—4th 1904, in 30—40 m. in Faxa Bay (mentioned above, p. 16). This catch, which is composed of fish ranging in size from 20 to 114 cm., mostly from 30 to 90 cm., is very representative of cod captured by a trawler on an offshore ground with shallow water in the summer season. Compared with the fish from Faxa Bay shown in Tables 1—2, p. 12—14, the fish in question must for the greater part be immature and belong to the III—IV-groups (with maximum-size at 38 and 50 cm.) though there is a lot (about one fourth) of older (5—6 years) and mature fish among the catch. (Fig. 6).

[1] I have also examined a lot of loose otoliths from cod of the same kind, caught in Grindavik in the main season 1917, and found them 2—20 years old, but most of them 8—9 years.

3) 2205 cod captured by a Faroese smack on handline, 110—200 m. depth off Isafjord Deep, June 4th—11th, 1904, and surveyed by one of the hands from the "Thor". This catch (Fig. 7) can serve as a typical catch made by handline on an offshore ground with usual depth. The size of the fish ranges from 46 to 126 cm., but the greatest part of it is between 50 and 103 cm., ɔ: the age must be (as will be seen by comparison with the table, p. 20) 4 years and upwards, mostly the V-—XI-gr., or mature fish.

4) As a typical catch made on longline on an offshore bank may be taken a catch of abt. 2600 cod, by the "Elin" 8 miles off Glettinganes, 100—180 m. in July 1904. The fish were surveyed under the supervision of SCHMIDT and constitutes the upper part of the fish dealt with in the graphical diagram on the plate VIII in his work Fiskeriundersøgelser. The fish (Fig. 8) ranges from 45 to 129 cm., with a marked paucity in individuals of about 80 cm. length. In accordance with the size of the cod from the East coast (table p. 25) all this fish must be 5 years old or more (V-—X-gr. and upward) and for the greater part mature or reaching maturity.

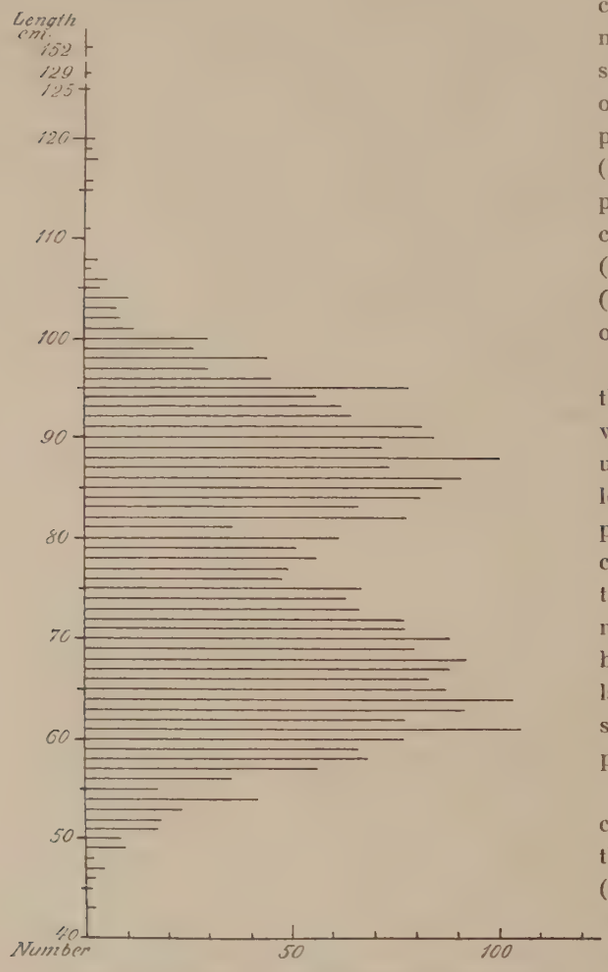

Fig. 8. Abt. 2600 cod, off Glettinganes July 1904.

From the examples given above it will be seen that the majority of cod caught on offshore grounds with deeper water (100—200 m.) are mature or grown up fish no matter what season, while those from shallower grounds and inshore waters are for the greatest part immature. This fact will be more obvious by glancing at the various Tables above, which show fish taken at all depths from the shore down to 200—300 m., for the greater part by commercial fishing craft, open boats and motor-boats, in common fishing places. The larger fish are taken in the deeper water, while the smaller (younger) and immature fish for the greatest part come from the lesser depths[1].

In older Icelandic statistics large cod and small cod were put down separately and according to these the greater part of the total yield of cod consisted of small (immature) fish, the number of these relatively increasing from the South to the East coast[2]. Unfortunately the modern statistics do not give the number of each sort separately, for which reason it is impossible to know the present state of the matter. Presumably it has not changed much in later years, and therefore the sentence may still hold good, that the greater part of the total catch of cod at Iceland consists of immature fish.

[1] Concerning the relation between the depth and the size (age) of the cod see: SCHMIDT: Fiskeriundersøgelser, p. 68.

[2] According to the Icelandic Statistics for 1905 the proportion between large and small cod was as follows:

Total number	Total number	Large cod	Small cod
South coast.....	785000	84 %	16 %
West coast.....	2314600	401 -	60 -
North coast.....	1000500	38 -	62 -
East coast	2150500	34 -	66 -

The fact that the majority of the cod caught in Iceland water are immature might be considered as no good omen for the future of the stock of this fish and the important fishery based upon it. But hitherto there are no reliable signs indicating any decrease, although some of the native fishermen are inclined to insist upon the contrary; especially do they look with no favourable eyes on the trawling, considering that the trawl takes too much fish, especially the young fish. Now it cannot be denied, that the trawl destroys great quantities of small fish of little or no value, when such fish happen to fall in its way. This is said to pass commonly on certain extraterritorial grounds off the North-west and the South-east coast and in Faxa Bay, and unfortunately it cannot be prevented while such grounds are not protected against trawling. On the other hand the young cod, which live in enormous quantities inside the territorial limit, are protected against destruction by the trawl as the use of it is forbidden there; and it is to be hoped that these myriads, which are composed of several (3—4) year-groups, will prove sufficient for repairing the great damage the fishery on the whole and especially the trawling must necessarily do to the great stock of the cod.

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